Enhancing food security through green technology - improving seed varieties – The state's efforts to achieve food security-

تعزيز الأمن الغذائي من خلال التكنولوجيا الخضراء – تحسين أصناف البذور –

جهود الدولة المبذولة لتحقيق الأمن الغذائي

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Abstract:

In 2024, Algeria's agricultural sector grew significantly due to new initiatives and projects focused on boosting production and food security, reflecting the commitment of public authorities to ensure the availability of agricultural products. L'Algérie vise la sécurité alimentaire en développant des pôles agricoles dans le sud et en créant une banque de semences en 2022.

This study investigated how the characteristics of improved seed varieties enhance food security What are the state's efforts to achieve self-sufficiency? We address relevant concepts by presenting a general framework for smart agriculture and food security and its components. Our findings highlighted that varietal improvement significantly enhances agricultural quality and specifications, ultimately leading to reduced agricultural product losses. This in turn produces greater quantity and higher productivity.

Keywords: food security, green technology, improving seed varieties, state agricultural efforts.

***JEL classification codes*:** Q10 ،Q16 ،Q18

الملخص:

شهد القطاع الزراعي في الجزائر في عام 2024 تطورًا ملحوظًا نتيجة للمبادرات والمشاريع الحديثة التي تهدف إلى تعزيز الإنتاج وضمان الأمن الغذائي، هذا التقدم يعكس التزام الحكومة بتوفير المنتجات الزراعية من حيث الكمية والقيمة الغذائية، تسعى الجزائر جاهدة لتحقيق الأمن الغذائي من خلال تطوير مختلف المجالات الزراعية.

تناولت هذه الدراسة كيفية تعزيز خصائص أصناف البذور المحسنة للأمن الغذائي، وجهود الدولة لتحقيق الاكتفاء الذاتي، تناولنا المفاهيم ذات الصلة من خلال تقديم إطار عام للزراعة الذكية والأمن الغذائي ومكوناتهما، بحيث أبرزت النتائج التي توصلنا إليها أن تحسين الأصناف يعزز بشكل كبير الجودة والمواصفات الزراعية، مما يؤدي في النهاية إلى تقليل خسائر المنتجات الزراعية، هذا بدوره ينتج كمية أكبر وإنتاجية أعلى ويقلل الفاقد وكذا رفع المردودية المالية.

الكلمات المفتاحية: **التكنولوجية الخضراء، تحسين الأصناف، الأمن الغذائي، جهود الزراعية للدولة.**

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1- Introduction:

Smart agriculture is an innovative system that harnesses cutting-edge technology to cultivate food in sustainable and eco-friendly ways, while optimizing the use of natural resources, particularly water. One of its standout features is the reliance on sophisticated information management and analysis systems, which empower farmers to make informed production decisions at minimal costs. Additionally, smart agriculture automates various agricultural processes, including irrigation, pest management, soil monitoring, and crop surveillance, enhancing efficiency and productivity in the farming sector.)https://www.awforum.org/index.php/ar(Adopting modern agricultural technology systems contributes to: (alghidhayiy, p. 07) Increase agricultural production rate; - rationalize water consumption; maintain plant health and protect against pests; - Saving use of fertilizers and pesticides; improving the efficiency of agricultural machinery use; improving crop productivity; - Minimizing the wastage of agricultural products ; Enhancing the quality and standards of agricultural goods ; Lowering additional operational expensesMonitoring the field condition and monitoring climate changes effectively and accurately;: (qasidi, 2021) - Improving the efficiency of using agricultural inputs such as fertilizers, pesticides and irrigation water; - Better control of costs and ensuring the profitability of agricultural projects; - Helping to make decisions quickly based on mobile phone software; - Direct link to market data through information software to make the right decision to market products; - Monitoring livestock, monitoring their health status and diagnosing diseases with the least cost and effort.

Green technologies are developing globally and are gradually spreading. The most appropriate technologies for the local context should be chosen, taking into account trade-offs and synergies. It should also be noted that technology is evolving rapidly, and what is considered green technology today may no longer be so in the future.

In this context, the following main problem comes to mind:

How can green technology “improvement of seed varieties” contribute to achieving food security? What are the state's efforts in this field?

- **Sub-questions :**

A set of sub-questions emerges from this key question:

- What are the modern technologies used in seed improvement?
- What is the role of the Seeds and Seedlings Research Unit (CNCC) ?
- What are the state's efforts to achieve food security?
- What is the reality of food security in Algeria?

- **Hypotheses :**

- Modern agricultural techniques play a major role in improving seeds.
- The Seed and Seedling Research Unit (CNCC) has a major role for food security.
- The Algerian state has made great efforts in the field of food security

- **Importance of study:**

Algeria, along with other nations characterized by challenging terrains, is investing in the advancement of smart agriculture by placing significant emphasis on specialized scientific research in the agricultural sector. There is a concerted effort to encourage young people to participate in agricultural programs and initiatives focused on food security. It is crucial to enhance the agricultural sector through the adoption of modern technological methods, aimed at improving production efficiency while also safeguarding the environment and food quality, maintains the highest calories, resists dehydration, and is easy to cook.

- Study objectives:

- Identification of the role of technology for improving varieties;
- Presenting smart agriculture as a contemporary approach to farming;
- Identification of technology and innovations in the agricultural sector ;
- The necessity of adopting smart agriculture as a strategic to ensure food security.

- Methodology:

In our research, we adopted a descriptive analytical approach to thoroughly explore the theoretical aspects of smart agriculture, with a particular focus on the improvement of seed varieties and their significant role in enhancing food security. This approach allowed us to present a comprehensive overview of how advancements in seed technology can lead to better crop yields and resilience against pests and diseases.

Additionally, we employed an investigative approach to examine the practical implications of our findings. This involved studying the role of the Seed and Seedling Research Unit (CNCC) and assessing the state's efforts in promoting agricultural innovation. We also analyzed the current reality of the agricultural sector, identifying challenges and opportunities in the quest for food security.

By combining these methodologies, our research provides a holistic view of the intersection between smart agriculture and food security, highlighting the

importance of improved seed varieties as a cornerstone for sustainable agricultural practices and enhanced food production.

- **Previous studies**:

- West of Ammar Farouk, Nashinesh Fatiha, Mohammed Baraq, **determinants of the success of start-ups in the field of hydroponics,** Scientific article published in the journal Prospects of Management Sciences and Economics In 2022, especially in the field of agriculture, which experienced a great failure at the global level, a study using the sectional time series of a sample of 25 startups in the field of hydroponics found that there is a difference in the nature of the relationship between the variables studied. and entrepreneurial success Government policy, government support programs, research and development, Social responsibility, laws and access to new markets are variables that have a positive impact on the success of start-ups in hydroponics in Algeria. (gharbi, 2022, p. 49)

- Aisha Salma Kahili, Lamia Omani, Edward Nashat, **Startups: A Model for Activating Innovation Among Small Farmers**, Scientific Article Published in the Journal of Contemporary Economic Research, 2022, The study finds that startups have contributed to addressing the challenges faced by the agricultural sector associated with the rational exploitation of natural resources (Water, soil) as well as the effects of climate change on production systems according to scientific and creative solutions proposed by emerging institutions to reach the stage of smart and sustainable agriculture for food security. (aicha s, 2022)

2- Modern techniques used in improving seed:

There are many modern techniques that are used to improve seed coefficients, and here are some examples of these techniques:

- Genomic technology: This technique is based on understanding the plant genome analyzed by DNA techniques;

- Gene editing technology: Used to modify plant genes, can be used to improve seed traits such as drought resistance, increase water use efficiency, or improve climate adaptability;

- Modern genetic breeding techniques: Used to improve seed traits, this can be achieved by reducing development and reproduction periods and improving tolerance and resistance to harsh environmental conditions.

- Biotechnology technologies: Biotechnology technologies such as the use of nanotechnology and smart material technologies are explored to improve seed performance;

- Sustainable seed development techniques: They are used to preserve the genetic diversity of seeds;

- Advanced testing and evaluation techniques: They are used to Assess the quality of seeds (genetic, physical physiological and seed health quality) field performance in different conditions of environmental and climatic changes. There are other techniques that are also used in improving seed coefficients, such as climate development techniques; Physical processing techniques;

Packaging and coating techniques; Comprehensive reduction techniques for diseases and pests; Simulation and forecasting techniques.

- **The ingredients of green technology:**

Smart agriculture contributes to achieving food security and ensuring its sustainability through the principles on which it is based, namely:

- Conservation and protection of the environment can be achieved through better management of natural resources, which includes sustainable resource use, improved land and water management, reduced chemical usage, enhanced land mapping, and better water management."
- Improving productivity: This applies to productivity on the farm in terms of yield, as well as increasing management efficiency;
- Fostering innovation in agriculture: Smart farming techniques allow innovative production methods on the animal and plant side, and at different stages of production from farm to market;
- Attracting new investment: Due to natural diversity and the dry climate situation, investors are encouraged to resort to new agricultural techniques in difficult and harsh environments;
- Creating green jobs: Allows adaptation and reduction of greenhouse gas emissions;
- Alleviating hunger and poverty: Through the enhancement of production and the improvement of agricultural crop quality.
- Transformation of animal waste into biogas: An alternative and renewable source of energy;
- Creating climate resilient fisheries and aquaculture: Through storm-resistant fish cages and ponds, and adaptive fisheries management;
- Increasing revenue: Value chain transparency raises the standard of food safety confidence with traceability, leading to increased value in the market; (mubarak A, 2020)
- Job creation: Create new jobs because new investors will join;
- Smart agriculture plays a dual role in reducing climate change and creating food sustainability.

Tableau N° : role of seed improvement in strengthening food security in Algeria,

Period	Actions/Initiatives	Impact on food security	Potential source
2000s	Introduction of improved seed varieties	Increased yields by 20 to 50% for certain crops	FAO, Report on agriculture in Algeria
2010s	Disease resistance research programs	Reduction of crop losses and improvement of production stability	INRA, Studies on agricultural research
2015s	Raising awareness among	Increased	Ministry of

	farmers on the use of adapted seeds	adoption of local and resistant seeds, reducing dependence on imports	Agriculture, Agricultural Statistics
2020s	Investments in agricultural research and sustainable development	Strengthening the resilience of agricultural systems to climate change	Academic publications on sustainable agriculture
2023s	Establishment of partnerships with international institutions	Access to innovative technologies and seeds, continuous improvement of food security	FAO, Partnerships for Food Security

Sources: FAO, INRA , Ministère de l'Agriculture et du Développement Rural en Algérie , Publications académiques

The Global Food Security Index (GFSI) is an innovative benchmarking framework that combines both quantitative and qualitative assessments, utilizing fifty-eight distinct indicators to evaluate the factors influencing food security in both developed and developing nations. This comprehensive model addresses various aspects of food security, including accessibility, availability, quality, and safety, as well as considerations related to natural resources and resilience, across a total of 113 countries worldwide. In the 2021 rankings, Algeria was positioned 54th in global food security, achieving an overall score of 63.9 out of 100. This score reflects 77.9 points for accessibility, 58.0 points for availability, 62.0 points for quality and safety, and 50.7 points for natural resources and resilience.(op – cit)

Statistically, using improved seeds can lead to higher yields. For example, studies show that improved seed varieties can increase yields of certain crops by 20 to 50 percent compared to traditional varieties, This is especially significant in a nation where agriculture plays a vital role in the economy and provides numerous jobs.

3- Seeds and seedlings research unit (cncc)

It was established through a joint ministerial decision on August 16, 2020, in association with the National Center for Control and Certification of Seedlings. Its responsibilities include conducting research on plant biotechnology as it pertains to seeds and seedlings, as well as assessing the existing genetic variation to inform all species selection and improvement processes. The unit consists of two sections: the first is dedicated to evaluating varieties, while the second focuses on seeds and seedlings. The work carried out

within this unit will contribute to the development of knowledge and methods to enhance the monitoring and certification systems for seeds and seedlings, as well as the performance of varieties. This will address the concerns of stakeholders in the seed and seedling sector, which is part of a sustainable development approach for the agricultural sector, ensuring the food security upon which the country relies.

Developing the production of seeds and seedlings is a top priority for strengthening the national capabilities needed to achieve food security. The current agricultural policy is focused on ensuring food security by placing significant emphasis on the development of the seed and seedlings sector, which is the foundational link in agricultural production. This approach aims to bolster the entire agricultural system, ensuring that it can meet the demands of the population and contribute to sustainable development.

The National Center for Seed and Seedling Control and Certification currently monitors and certifies 180,000 hectares of field seeds, 22,000 hectares of potato seedlings, and 12,500,000 seedlings of fruit trees and vines.

Certification is an irreplaceable tool for evaluating agricultural products, especially plant materials, by ensuring a recognized production system that meets international requirements, It contributes significantly to the development and modernization of the agricultural sector and raising production while improving quality, The Potato Division, which contains 39 cultivars for processing and 47 cultivars for conversion and consumption, was able to achieve a surplus that can be directed abroad as part of efforts to promote exports and diversify the national economy.

Intensifying studies and research aimed at developing and researching seeds and identifying appropriate varieties according to environmental conditions, as good results have been reached regarding some drought-resistant varieties, especially directed to the southern regions, In addition to the necessity of controlling seeds for other agricultural varieties, such as food corn and corn intended for animal feed ; And to continue efforts to supply the production of quality seeds and cover needs in the field of mechanization to address the labor shortage and strengthen the control system ; Organizing open doors under the slogan “Certification in the Service of Food Security and National Sovereignty,” because the certification process is considered an important and necessary means to give greater value to plant and agricultural products, ensuring their credibility in the production chain in accordance with applicable legal standards, which facilitates their international marketing.) Agency(2025 ،

4. State efforts to achieve food security:

The efforts of the State have included a planned development strategy through the modernization of agriculture and food security in its comprehensive concept and placed it at the heart of national priorities: (Development, 2024)

- A number of development initiatives have been undertaken to enhance the living conditions of citizens, particularly in rural areas;
- Re-examination of the Green Dam rehabilitation project was undertaken.
- Establishment of drought-resistant fruit tree programmers;
- In order to rationalize the use of water resources, irrigation areas will be expanded and water networks will be supported ;
- The Ministry of Irrigation and the Ministry of Agriculture are attempting to improve the water security of agricultural irrigation by strategizing, valuing and utilizing the 70 per cent of the water that is extracted from the filtering areas of agricultural irrigation; (Al-Tawoos G. &., 2021)
- Expanding irrigated agricultural areas and raising agricultural production to enhance food security;
- Diversifying sources of financing to ensure the sustainable growth of the agricultural sector;
- The reorganization and stimulation of the mechanical industry of agricultural machinery for the general public, and private sectors at the national level, such as the CRMA plant for the public sector and FAMAG factory for the private sector, Sidi Bel Abbas, as a model;
- Attention to agriculture in large areas through investment in desert agriculture;
- Establishment of modern agricultural poles specialized in the strategic agricultural people of the South such as cereals, oil crops, sugar; feed, legumes, seeds and others;

A partnership agreement the promotion of agricultural investment in the South, particularly in the field of strategic agriculture, is a collaborative effort between the Ministry of Agriculture and the Economic Renewal Council, by accompanying economic operators to achieve the established objectives;

- Algeria's participation in the Doha Expo, organized from 02 October 2023 to 28 March 2024 under the slogan "**Green Desert is a Better Environment,**" which is the first international horticulture exhibition to be held in the Middle East, where the desert climate is predominant, addressing several topics: Modern agriculture, The areas of focus include technology and innovation, environmental quality, and environmental sustainability.
- was carried out during the 37th session of the FAO Conference for the Near East. and North Africa, 04 March 2024, dealt with several topics related to sustainable development and food security and policies adopted to confront various crises and challenges. Algeria presented the development strategy adopted by the; (fao)
- The university's involvement in specialized human resources draws attention to them, and vocational training centres in the training process and students interested in the agricultural field through the introduction of the specialization of agriculture at the university level, the School of Agriculture of Sidi Bel Abbas University for the year 2024; Specializations at the vocational

training level in the field of agriculture and animal husbandry, with attention to specialized centres The National Institute of Agriculture and the Technological Institute are part of the Ministry of Agriculture. Institute specializing in agricultural training in Ain Temchent;

- Attention to typical plantations such as the demonstration plantation and seed production - Mahdia - Tiaret State ITAFV, which is concerned with the development and planting of drought-resistant fruit trees;

- Study offices specializing in agriculture;

- Linking manufacturing and agricultural investment as a tool for achieving food security;

-The National Strategic Agricultural Development Plan for the Southern States was organized by the Ministry of Agriculture and Rural Development on Monday, November 4, 2024, at the headquarters of the Ministry of Finance, Minister of Irrigation, Minister of Post and Telecommunications, The Minister of Public Works and Grassroots Establishments devoted to studying the needs related to the establishment of grassroots structures and infrastructure for agricultural reclamation oceans in the southern states. (web, https://madr.gov.dz)

- The aim of this meeting was to develop a road paper to address the special needs of the agricultural oceans and link them to various networks (electricity, gas, roads, fiber optics... etc.), including the two projects of powdered milk production in partnership with the Qatari company "Baladna" and the production of grains, legumes and food slurries in partnership with the Italian BF.

- The agricultural sector is important to the highest authorities of the country and must reflect the objectives entrusted to it to enhance food security. The Minister of Agriculture and Rural Development The sector seeks to reclaim one million hectares through watering horizons 2027, and achieve self-sufficiency in the material of hard wheat, corn and barley starting from 2025 In addition to the development of oily and sugary plants and dry pulses, And milk, as well as the completion of 350 neighboring storage centers and 30 strategic silos, within the framework of the national plan for the development of strategic crops.

- Algeria, which previously imported cereal seeds, was able to achieve self-sufficiency in this field, as it refrained from importing this strategic material from abroad for 25 years, which allowed it to enhance its food security and provide the public treasury with more than 400 million dollars annually.

- Algeria relies on national competencies of experts and technicians to develop strategic agriculture and reduce its import of agricultural materials.

- The government is moving to exploit all available productive capacities, especially in the south and the high plateaus. This requires monitoring seeds approved by the internationally accredited laboratory of the National Center for Seed and Seedling Control.

- The Minister also pointed out the development of desert agriculture, especially in Adrar, Ouargla, El Oued and Ghardaia, that the southern regions have become poles of agricultural production, and that the government's policy seeks to bring investments to these regions by encouraging industrial agriculture directed to the manufacturing industry.

- The success of agriculture in the south depends on basic elements, including controlling the technical paths of seeds and exploiting natural energies such as water, renewable energies, and human capabilities within the framework of a solid strategy that seeks to achieve food security.

- The 420-million-euro investment aims to enhance domestic production of grains and pulses while promoting non-hydrocarbon exports, particularly in the pasta sector. This initiative is anticipated to create more than 6,700 jobs, including 1,600 permanent positions. (al24news, 2025) ;

- Agriculture, generating an impressive $37 billion in value, stands as the second-largest contributor to the GDP ;

- The 420-million-euro investment is focused on expanding the production of domestic grains and pulses, while also enhancing non-hydrocarbon exports, particularly in the pasta industry. This initiative is projected to create more than 6,700 jobs, including 1,600 permanent positions, contributing significantly to the economy ;

- A collaboration between BF and the Algerian state, represented by the National Investment Fund (FNI), spans an impressive area of 36,000 hectares in the Timimoun province. This partnership aims to enhance agricultural production and boost the local economy ;

- In April 2024, a significant agreement was established with the Qatari company Baladna for an integrated project focused on dairy cattle farming and milk powder production in the province of Adrar. This initiative aims to enhance local dairy production and contribute to the region's agricultural development ;

- The extensive 117,000-hectare project consists of three centers, each incorporating a farm for grain and fodder production, a dairy and beef cattle farm, and a milk powder manufacturing facility ;

- Funding contracts for management were delivered to six scientific research and development units affiliated with the national and sectoral technical institutes, and the financial cover directed to these units amounts to about 15 billion centimes ; (cncc, 2025)

-Official data confirmed that the agricultural sector's contribution to Algeria's total economic output in 2023 amounted to $35 billion, at a time when agricultural production is witnessing remarkable progress, reaching a figure of 12 percent to 14 percent annually.

- This support represents the actual launch signal for research activities, in place of the programs that have been established. Other support has been allocated and will be granted to these laboratories later in 2025 so that they can acquire necessary equipment ; (Agency, 2025)

-The FAO has repeatedly highlighted Algeria's significant progress in food security, ranking it first among African countries and 54th globally in 2021. These achievements reflect Algeria's expertise and its potential to share valuable experiences in enhancing food security.

-The Chairman of the Oman Investment Authority confirmed that he is looking forward to identifying a group of projects in the targeted basic sectors, which are the food security sector and the pharmaceutical industries sector. (cncc, 2025) ;

- The state of Ain Defla, known nationally for its abundant production of potatoes, covering 35 percent of the national needs in this field, is preparing to begin construction of a factory specialized in transforming this highly consumed material. (khddawy, 2012) ;

- The initiative involves organizing training courses and scientific seminars aimed at raising awareness about the significance of seeds. This effort is encapsulated in the slogan: “Enhancing and developing new varieties of various types of seeds for strategic cultivation, in alignment with the Algerian state's policy to achieve food security.” This program seeks to educate stakeholders on the critical role of seed innovation in ensuring sustainable agricultural practices and food availability.

- The director of the National Institute for Agricultural Research emphasized that the institute focuses on developing plant varieties that adapt to the climatic conditions in Algeria and require smaller amounts of water. To achieve sustainability in the agricultural sector.”

- An agreement was concluded between Algerian and American investors specialized in potato processing. The project creates new job positions and contributes to reducing the surplus production of this consumable item and thus reducing the fluctuation in its prices ;

- Financial support for farmers to encourage them to invest in the potato sector and to obtain insurance against agricultural risks.

The Center currently monitors and certifies 180,000 hectares of field seeds, 22,000 hectares of potato seedlings, and 12,500,000 seedlings of fruit trees and vines. (aps, 2025)

In its endeavour to achieve food security, the State has taken a number of measures, such as promoting agricultural cooperation as an effective means of developing the Agriculture Division and ensuring food security; Revitalizing the Grain Division and accompanying the peasants in order to increase and maintain production through the establishment of a unified net, comprehensive insurance of peasant crops to meet all the challenges of natural disasters that may affect the returns, and social insurance for peasants; Accompanying the peasants financially and technically; Enabling the Agricultural Cooperation Fund to grant short- and medium-term loans; The inauguration of the National Committee for the General Statistics of Agriculture (RGA) headed by the Minister of Agriculture from 18 Fevery to 03 March 2024, The reference file for agricultural

inv is being studied by the group, which is carrying out several tasks, (Website) estors and exploiters, as this statistic will be an important reference and source for researchers, specialists in planning, experts and all actors.

About three years after the launch of the "New Algeria" effort, the country is moving steadily forward in the field of developing and modernizing its agricultural sector through structural reforms such as encouraging investment, providing agricultural real estate, and removing obstacles in the field of financing, which has been reflected positively on many indicators.

The sector has now contributed about one-sixth (about 15 percent) to the gross national product and represents more than a quarter of the active labor force, equivalent to 3 million workers, while the value of agricultural production in 2022 was estimated at 4.550 billion DZD, compared to 3.500 billion DZD in 2021

- **The reality of food security in Algeria :**

The size of the agriculture market in Algeria is estimated at US$4.86 billion in 2024, and is expected to reach US$6.09 billion by 2029, with a compound annual growth rate of 4.65% during the forecast period (2024-2029). Algeria is currently the largest country in Africa and the Arab world, with a total area of 2.38 million square kilometers. It is rich in natural resources. Its general strategy is to reduce its dependence on imports. The Algerian agricultural sector has recorded growth, despite many fluctuations. It is technically capable of producing 30 million tons of grain annually and exporting 21 million tons of it to neighboring countries.

About 70 percent of the country's farms are small-sized, ranging in size from 0.1 to about 10 hectares. The Algerian government seeks to develop and modernize agriculture as a way to diversify the economy and attract foreign and domestic investments. Government policies and programs are intended to increase domestic production, privatize the seed sector and invest in agricultural infrastructure A move toward large-scale agriculture and win-win partnerships with experienced foreign investors such as the Netherlands would also help achieve these goals, and may potentially increase the amount of exports of locally produced goods on a large scale, especially since Algeria is a prominent country. A member of the African Continental Free Trade Area (AfCFTA), it can therefore be described as an efficient gateway for the sale of goods and products in this massive integrated market of 1.2 billion people.

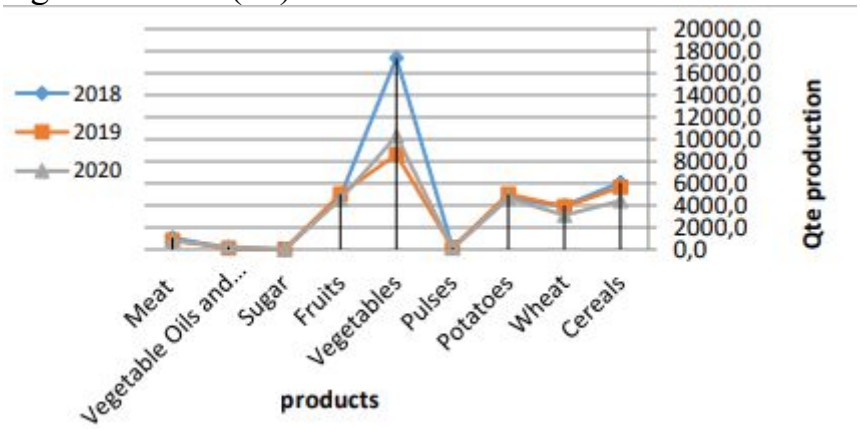
According to the agricultural programs in place in Algeria since the year 2000, and within the framework of winning the food security stake, the agricultural sector has achieved the production of significant quantities of agricultural, plant and animal food commodities. Despite the quantitative development in this production, it has witnessed disturbances for some products due to climatic factors sometimes and economic factors at other times.

According to the most recent report from May 2023 by the Arab Monetary Fund regarding the Economist Impact 2022 Global Food Security Index (GFSI), Algeria achieved a moderate ranking, placing 10th among Arab nations and 68th worldwide, with a GFSI score of 58.9. This index provides valuable insights into different aspects of food security .(limaya & buekaz, 2023, p. 79) . This sector, which was the main driver of growth in 2020, is facing a decline Important during the year 2021 and unprecedented since 2002, a negative growth rate in terms of volume is estimated at 1.3%. (mordorintelligence, 2024)

Less than 2.6 points from the year 2020, despite the easing of health restrictions. The following figure shows the growth rate of the agricultural sector. From the figure we notice a continuous decline in the rate of agricultural output during the period 2018 to 2021, and this Due to the unfavorable climate conditions, the increase in the prices of agricultural inputs and the tightening of their import conditions, wheat is considered one of the most important crops to decline, as it decreased from 43.9 million quintals in 2020 to 27.6 million quintals in 2021. In addition, olive production decreased by 34% as a result of forest fires. (Algeria, 2022). Algeria exports 160 vegetables and fruits annually, but the development of the agricultural sector is facing purely technical and climatic challenges.

Livestock production constitutes an important part, whether in terms of its contribution to the agricultural domestic product or through its contribution to covering the population's consumption needs for various animal products.

Figure number (01): Production Index



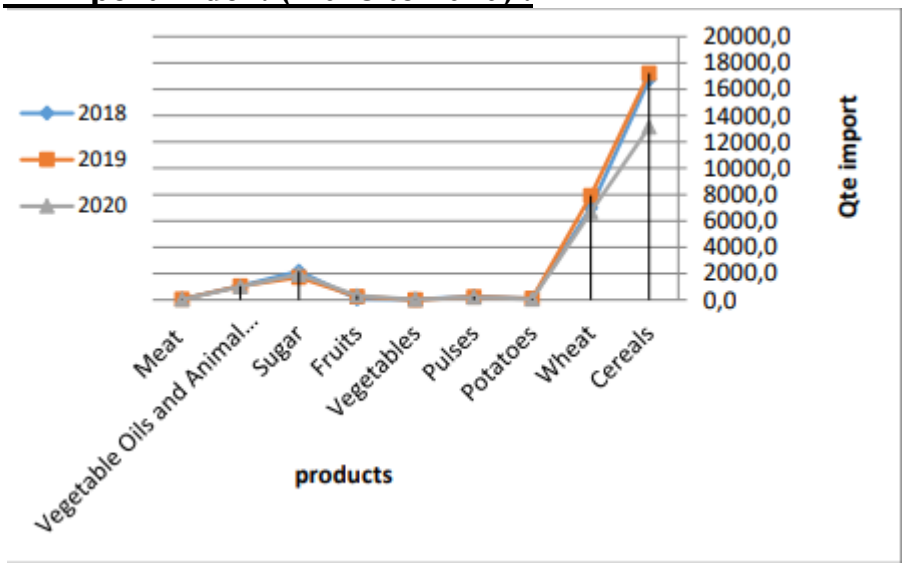
Source : RABEHI Fatima, KERMIA Nesrine, **The reality and challenges of achieving food security in Algeria during the period 2018-2023**, JOURNAL OF AL MAYADINE AL IKTISSADIA VOL: 06, ISS: 01, 2023, Pages (521/539)

In contrast, agricultural production in Algeria saw a significant increase of 38% in 2022 compared to 2021. This growth includes the grain sector, which yielded 41 million quintals during the 2021-2022 agricultural season, representing a 48% rise from the previous season. The production of dry legumes rose by 20%, while potato production, a staple food for Algerians, increased by 30%. Additionally, there were notable increases in the production

of red and white meat, as well as milk. According to the Minister of Agriculture, this boost in production enabled Algeria to meet 75% of its domestic food requirements. Recently, the country has also experienced agricultural diversification in desert regions. Despite the challenging desert climate, significant advancements in grain cultivation have been made, with over 81,900 hectares dedicated to this purpose, particularly in the Ziban region.(op,cit).

Vegetable cultivation currently spans approximately 92,736 hectares, with 41% of this area dedicated to potato production. In addition, fruit tree cultivation encompasses 21,203 hectares, where olives are the predominant crop, covering 80,010 hectares, followed by apricots and pomegranates, sheep breeding dominates with a percentage of 69 percent.

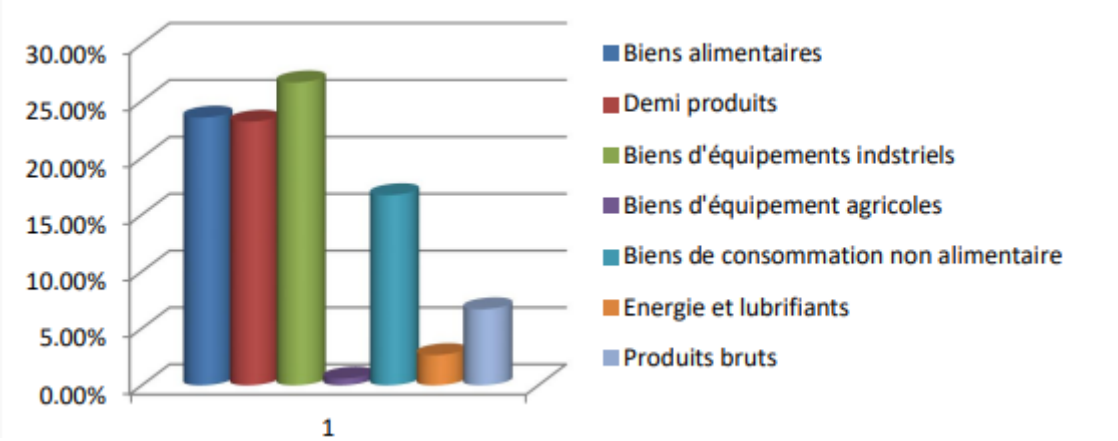
2- Import Index: (2018 to 2020) .



Source : RABEHI Fatima, KERMIA Nesrine, Op Cite

results of this index indicate a decrease in the importation process of goods, Although Algeria It aboundsa large expanse of agricultural land and farmers have made substantial efforts, the cost of grain imports has consistently risen from 2018 to 2020.

Figure No : Structure of Algerian imports by use group

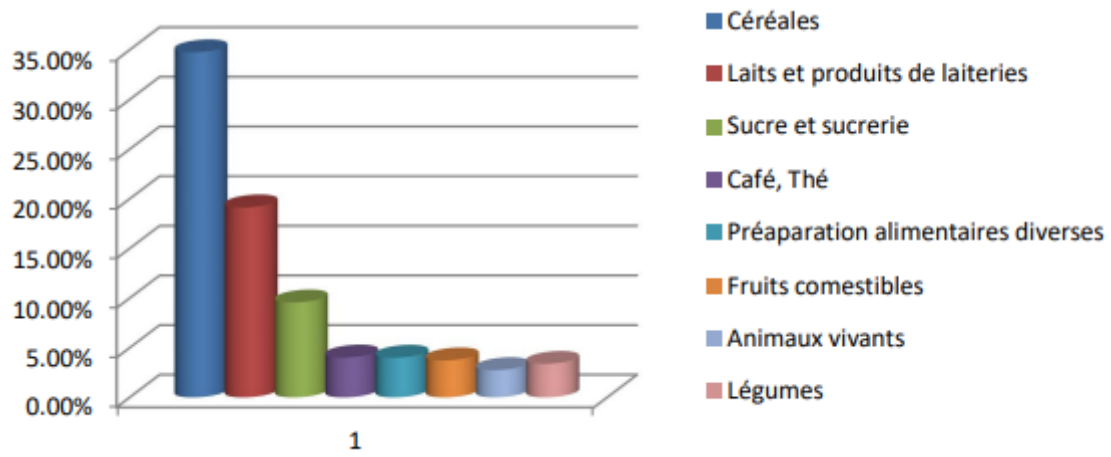


Source : CHERROU Kahina, **La sécurité alimentaire en Algérie : Enjeux et défis Food security in Algeria: issues and challenges**, Revue Etudes Economiques, 2023.

Most Algerian imports consist of food products, the direct link between food price volatility and food security. It is also important to emphasize that the issue of food security is of crucial importance for the Algerian economy, especially in a context of continued population growth.

We noted that the composition of these imports is dominated by certain food substances, in this case cereals. It is clear that the increase of raw material prices has a direct effect on the Algerian economy.

Figure No. 3. cereals in food imports to Algeria in 2020



Source : CHERROU Kahina, **La sécurité alimentaire en Algérie : Enjeux et défis Food security in Algeria: issues and challenges**, Revue Etudes Economiques, 2023.

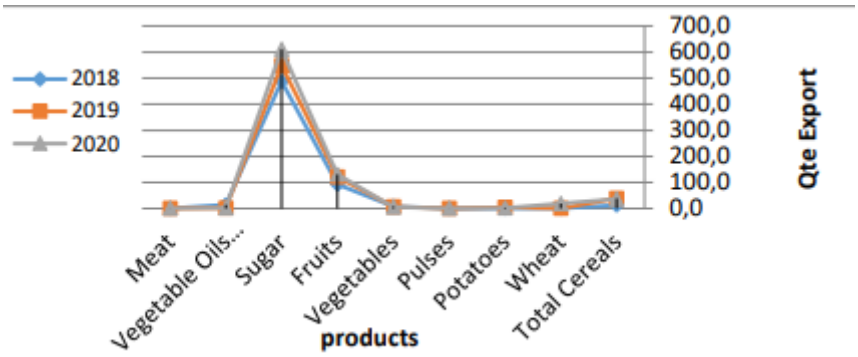
Algeria depends on food imports such as cereals (wheat, corn, rice) but also dairy products. In fact, according to estimates from the customs department, published in 2020, in the "foreign trade statistics" report, the sole of agricultural trade balance is – 6962.82 million dollars. This dependence is a source of food insecurity due to price volatility agricultural raw materials on international markets. Knowing that cereals.(op cit)

3- Export Index: (2018 to 2020).

results of this index are weak and almost nonexistent for most commodities. The COVID-19 pandemic had a significant impact during this period. Consequently, most export operations were suspended, and countries prioritized the use of their own production.

Despite being relatively low in relation to the population size, the amounts of meat, oils, fats, sugar, and legumes that were available for consumption stayed mostly consistent over the course of the three years. While the amount of vegetables that were available for consumption decreased, the amounts of fruits, potatoes, wheat, and flour stayed largely unchanged. Although there were still enough grains available for consumption overall, there were 17,478.2 thousand tons less in 2020.

Available for consumption Index:

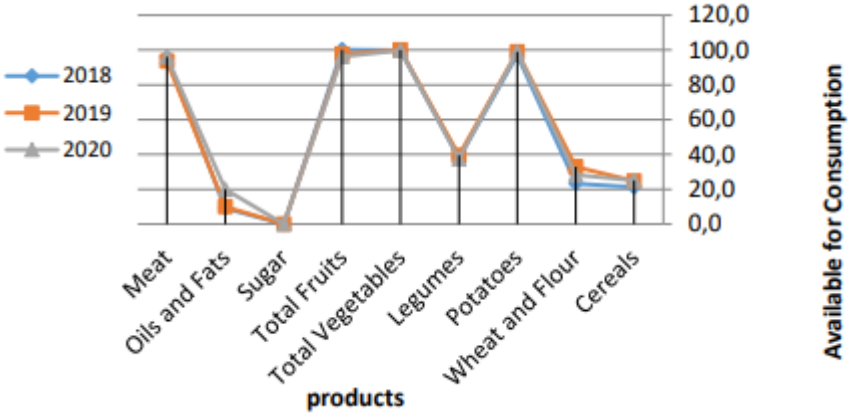


Source : RABEHI Fatima, KERMIA Nesrine, Op Cite

- **Self-Sufficiency Ratio:**

ratio index for the 2018–2020 timeframe. The fact that sugar is not self-sufficient is noteworthy. With averages of about 13%, 23.7%, and 28.1%, respectively, oils and fats, grains, wheat, and flour all have extremely low self-sufficiency ratios. However, with an average self-sufficiency ratio of 38.4%, legumes have a comparatively higher ratio. However, the self-sufficiency ratio of meat, vegetables, fruits, and potatoes is notably higher than 90%

Figure number : self-sufficiency ratio



Source : RABEHI Fatima, KERMIA Nesrine, Op Cite

Conclusion:

As a summary of the research on the detrimental effects of agricultural practices, we discuss the different findings that were obtained at the end of our study. innovations and technological methods as a means of attaining food security, The following sub-questions should be addressed in order to determine the viability of the hypotheses stated in the introduction. The results should then be presented in order to offer suggestions and recommendations that can be applied at the level of the scientific study ;

Examining methods for marketing and storing fruits and vegetables in frozen rooms; advancing scientific research in the food and agriculture sectors to

help develop agricultural systems that guarantee consistent and sustainable food availability while maintaining consumer health security.

Hypothesis testing :

- Yes, modern agricultural techniques play a major role in improving seeds because they are very advanced and lead to improving seed varieties from one generation to another, which reduces bad and damaged seeds.
- Yes, the Seeds and Seedlings Research Unit (CNCC) has a somewhat important role in the field of food security. That is to say, it seeks to monitor seedlings and seeds and grant certificates of compliance with international standards, and thus it achieves the quality of seeds and seedlings.
- Yes, the Algerian state has made and continues to make great efforts in the field of food security, by accompanying farmers, diversifying financial financing, encouraging agriculture in large areas (the south for example), training and training (scientific qualification) for farmers, developing agricultural equipment... and others.

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