

Food Safety as a pillar of Food Security (The Case of Algeria)

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Abstract: This research highlights the topic of Food Safety, a relatively recent subject, particularly in terms of its legal and managerial handling, given its importance as it pertains to human health and daily food consumption, essential for fulfilling basic human needs. Food safety encompasses a set of practices and procedures that ensure the food we consume is safe and free from microbiological hazards and harmful substances that could lead to food poisoning and other illnesses.

The spread of foodborne diseases is notably increasing, and global food trade faces disruptions due to frequent disputes regarding food safety and quality. Consequently, there is a pressing need to review and strengthen food control systems and to make necessary improvements. Developing countries, including Algeria, are thus working to establish and implement a food safety control system based on the risk assessment concept represents a contemporary approach.

Keywords: Food Safety; Food Security; Food Quality; Food Control.

Jel Classification Codes : Q18; I18.

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Introduction:

Food safety is one of the essential topics today, relevant across the fields of food, health, and even production quality standards. It is directly connected to human health and, more broadly, to overall well-being. Food safety represents a set of procedures and controls designed to ensure that food is free from biological, chemical, or physical contaminants that could cause illness, thereby ensuring food safety for consumers.

With growing concerns about food security in Algeria, especially regarding food safety as a component of food security, attention to this issue has become more pressing. The significant increase in population necessitates higher production to bridge the food gap. As production rises, so do the standards required for the handling, storage, and preservation of both produced and unproduced food products. On the margins of fostering public trust in its food-related policies, the government must place considerable emphasis on food safety.

Study Problem:

From the foregoing, and within the framework of achieving comprehensive food security of which food safety is a core pillar, the following research question arises:

To what extent has Algeria succeeded in achieving food safety?

This question leads to the following sub-questions:

- What is the current state of food safety in Algeria?
- What obstacles hinder the achievement of food security and food safety in Algeria?
- What policies does Algeria follow to ensure food safety?
- Is achieving food safety directly linked to achieving food security?

Study Hypotheses:

The following hypotheses are proposed to address our research topic:

- The level of food security in Algeria is unstable, as is the pursuit of food safety, due to various reasons that require investigation.
- Algeria is working to achieve food safety through the establishment of diverse policy, legal, and technical frameworks.
- Food safety is closely connected to the state of food security.

Study Significance:

The significance of this study lies in its focus on key issues that promote stability and security in any nation, namely food security and food safety. Given prevailing global conditions and developments in agricultural production and food industries, this study aims to demonstrate the role of food safety within food security, reflecting the state's commitment to preserving public health and meeting citizens' needs. Furthermore, the study addresses how food safety gaps can lead to food security challenges and examines the barriers that hinder its achievement, with a focus on shortcomings in food safety implementation.

Study Objectives:

Through this study, we aim to:

- Recognize the principles and nature of food safety;
- Evaluate Algeria's food safety and security situation;
- Identify the government's efforts to achieve food safety.

Study Methodology:

To thoroughly examine the aspects of this study, a descriptive method was employed to define key concepts related to food safety and food security. Additionally, by examining Algeria's food security and safety situation and interpreting pertinent data, an analytical technique was applied to give the study an inductive aspect.

Literature Review:

-Djamel Hamladji, Commitment to Ensuring Safety in Food Products Intended for Consumption, Maarif Journal, Volume 18, Issue 2, University of Bouira, 2023: Through his study, the researcher highlights the importance of ensuring the safety of food products through compliance reports, which guarantee that food is free from any harmful substances that could jeopardize consumer health. He emphasizes the need for this commitment to be embedded in Algerian legislation, advocating for the implementation of a commitment to food safety as a means to resolve disputes in this field. He also outlines key pillars to ensure food safety, a portion of which has been referenced in this work.

-Lakhdari Abdelhak and Zeghlami Hassiba, Consumer Protection Through the Commitment to ensure Food Safety, Journal of Rights and Freedoms, Issue 4, University of Cheikh Al-Arbi Tebessi, Tebessa, 2017: In their research, the authors underscore that consumer

protection, which is one of the consumer's most essential rights, requires that those involved in food production ensure the safety of products, free from harmful substances. This commitment is mandated by the Consumer Protection Law, Anti-Fraud Law, and other regulations that must be respected in the food industry. This research primarily focuses on the technical standards required to ensure the safety of food products as dictated by laws.

-Sheikh Salem Omar Al-Ashqar and Awatif Zarara, The Impact of the COVID-19 Pandemic on the Consumer's Right to Food Safety (The Case of the United Arab Emirates), Journal of Research in Contracts and Business Law, Volume 07, Issue 04, University of Sharjah, United Arab Emirates, 2022: This study aims to demonstrate the importance of crises in developing and implementing procedures tailored to current circumstances. The researchers examine the impact of the COVID-19 pandemic on establishing extensive precautionary measures in food production and enhancing safety guarantees, with a focus on food production monitoring systems, civil and criminal protections for consumers, and the need to raise consumer awareness about food safety.

Through these and other studies, there is a noticeable focus on the legal and legislative frameworks that ensure food safety, as well as the technical aspects of producing safe, consumable food. However, this research only addresses food industries, omitting the initial stages of food production that begin with agriculture and crop harvesting. Furthermore, it does not connect to the broader topic of food security, which is currently a significant global concern.

Study Structure:

To address the research problem, this study will explore the following themes:

- Theme One: The conceptual framework of food security and food safety
- Theme Two: Algeria's efforts in establishing food safety to achieve food security

I- The Conceptual Framework of Food Security and Food Safety:

Food security is a crucial topic in national economies, reflecting efforts by states to meet citizens' basic needs, provide adequate food supplies, and ensure stability. It is closely related to similar concepts such as self-sufficiency, food dependency, and sustainable

development, and is grounded in fundamental principles that serve as a foundation for achieving self-sufficiency.

Food safety, meanwhile, is a fundamental individual right that must be ensured even if food security is not fully achieved. Neglecting food safety inevitably leads to severe harm to individuals, with adverse impacts on national progress and economic stability, underscoring the significant importance of this issue.

I.1. The Concept of Food Security:

Food security has various definitions, reflecting its multidimensional nature:

I.1.1. Definition of Food Security:

It is the ability to regularly supply food needs for society members (Arabi, 2010, p. 52) within their income limits (Ahmed, 2016, p. 15), at appropriate times, without the anticipation of future shortages (Al-Kubaisi, 2014, p. 22).

Food security is providing enough safe food that satisfies people's dietary requirements and choices while also giving them the physical, social, and financial resources to lead active, healthy lives, according to the Food and Agriculture Organization (FAO) (Group of Experts, 2009, p. 08). Algerian legislation, in Article 03 of Law No. 08-16 on Agricultural Orientation, defines food security as "the availability and regular access for every person to sufficient, safe food, allowing them to lead an active life (Article 03 of Law No. 08-16, 2008)."

From these definitions, we can conclude that food security is the sense of assurance for individuals that food supplies and necessary nutritional elements are available in required, healthy quantities. It also involves income that aligns with their purchasing power, and guarantees a subsistence level of food for those who cannot otherwise access it.

Food security is characterized by the availability of food goods in the market and a strategic reserve of food to confront emergencies and crises. It includes a wide variety of necessary and healthy foods, drinks, and nutritional supplies in quantities required by people within a specific time frame.

I.1.2. Forms of Food Security:

Food security is categorized into different types as outlined in the following table:

Table (01): Forms of Food Security

A. Absolute Food Security - Self-Sufficiency
The production of food within a country in quantities that meet or exceed its domestic demand (Al-Bayani, 2011, p. 84), allowing the country to fulfill its needs solely through local production. In this case, its exports surpass its imports, which corresponds to the concept of full self-sufficiency, commonly referred to as self-reliant food security.
B. Relative Food Security
The provision of the necessary resources to meet these needs either domestically or through cooperation and exchange with other countries. Thus, the concept of relative food security refers to ensuring food supply in collaboration with others (Arabi, 2010, p. 53). This implies the ability of a country or a group of countries to fully or partially provide essential food products and materials while guaranteeing a minimum level of these needs on a regular basis.
C. Apparent or Superficial Food Security
If a country covers 90% of its needs for a certain commodity through domestic production, for example, while importing most of the inputs, this figure is misleading and does not reflect the actual situation. Consequently, its food security is considered superficial. This means that the country possesses only a very small portion of the commodity's components and imports more than it produces. In other words, most of the constituent materials are imported, which implies that the country only displays what it produces and conceals what it imports. As a result, this does not accurately reflect the true situation, which is referred to as superficial food security.
D. Sustainable Food Security
It refers to the provision of safe and healthy food for the current generations without compromising the right of future generations to access the same or a higher level of food quality (Khaznaji & Berkane, 2012-2013, p. 07). In other words, it involves ensuring the availability of food to meet the needs of an ever-growing population. Therefore, sustainable food security should be viewed as a dynamic concept that reflects the relationship between the increasing population and their food requirements.

The challenge facing policymakers is how to sufficiently, healthily, and safely increase agricultural and food productivity while achieving food security and continuously enhancing the productive capacity of the natural resource base (Bakkadi & Basha, 2017, p. 45).

I.1.3. Foundations and Pillars of Achieving Food Security:

Food security in any country is based on a set of foundations and pillars, without which achieving food security for its population is

unimaginable. To ensure its availability, the following must be considered:

Figure 01: Foundations and Pillars of Food Security



Food commodities are provided in the 1st phase, with little attention paid to quality and a primary focus on quantity because demand for food exceeds availability. Once this stage is achieved, the process moves on to the next phase, which expands its scope to consider the quality of food (Slatnia & Ararour, 2009, p. 09).

The 2nd phase entails ensuring the constant availability of food commodities in the market. At this stage, the focus shifts toward balancing quantity and quality, emphasizing nutritional value. Attention is given to the body's dietary needs, enabling individuals to perform their activities efficiently. Following this, the focus shifts to consumption (Boualam, 2019-2020, p. 15).

The 3rd phase aims to make food prices affordable for everyone. During this stage, middle-class and lower-class earnings are either increased or commodities prices are decreased. Achieving this depends on a series of political decisions and measures that fall under the state's responsibility in ensuring food security (Slatnia & Ararour, 2009, p. 10).

In the 4th phase, the emphasis shifts to the health aspects of food commodities, commonly referred to as food safety, which ensures consumer protection from potential risks associated with food products, complementing the role of food in promoting individual well-being and satisfaction.

Initially, the focus in production was on ensuring the availability of food commodities (quantity), later evolved into an emphasis on quality or a balance between quantity and quality, followed by the health and environmental dimensions of food commodities encompassing food safety across all stages, (Al-Jureisi, p. 42).

Finally, there is the emphasis on respecting diversity and social customs, which entails adopting acceptable systems for food distribution and security. These systems should honor human dignity and cultural practices, ensuring that food commodities are acceptable to all segments of society based on their needs (Bakkadi & Basha, 2017, p. 41).

1.2. The nature of Food Safety:

By exploring the idea of food security in detail and looking at its main components, such as the guarantee of food safety, the central role of food safety in building and achieving food security becomes evident. This leads us to explore the essence of food safety.

1.2.1. Definition of Food Safety:

Food safety refers to the complete absence of, or the presence of acceptable and non-harmful levels of, contaminants, adulterants, natural toxins, or any other substances in food that could render the product acutely or chronically harmful to health (Law No. 09-03). Food safety is a fundamental human right, inherently linked to the broader right to health and physical well-being. It ensures the consumption of safe food products free from pollutants, adulterants, or natural toxins (Imam, p. 26).

Various legal texts aim to establish a comprehensive understanding of this concept. One such example is the Protocol on Social Safety, ratified by Algeria in 2004. According to this protocol, the principle of precaution and safety aims to protect consumers, the environment, and promote sustainable development. Article 1 of the protocol (04-170, 2004), referencing Principle 15 of the Rio Declaration on Environment and Development, states that its objective is to contribute to an adequate level of protection against risks that may harm humans. A notable focus is the prevention of risks arising from contaminants, including those spread through transport and the use of living organisms. These protocols serve as a precautionary guide for those responsible for ensuring that consumed materials remain unpolluted and safe for human health.

It is essential that consumers have faith in food safety. Foodborne disease outbreaks brought on by *Salmonella*, *Escherichia coli*, or chemical toxins raise questions about food safety and the effectiveness of contemporary agricultural and food processing methods in

preserving public health. Food hazards can due to a number of circumstances, including:

- Unsafe agricultural practices;
- Poor hygiene throughout the food supply chain;
- Lack of preventive control during processing and preparation;
- Misuse of chemicals;
- Contamination of raw materials, ingredients, or water;
- Inadequate or unsafe storage.

The following are particular food safety concerns:

- Microbiological risks;
- Remaining pesticides;
- Using food additives improperly;
- Food adulteration and chemical pollutants, including biological poisons;
- Fraud.

I.2.2. Food Safety and Food Quality:

There is often confusion between food safety and food quality. Food safety refers to all potential hazards whether chronic or acute that could render food harmful to consumers' health. It is non-negotiable. On the other hand, food quality encompasses all other attributes influencing consumer evaluation of products. These attributes include negative aspects such as spoilage, dirt contamination, discoloration, or unpleasant odors, as well as positive attributes such as origin, color, taste, aroma, texture, and preparation methods.

This distinction between food safety and food quality has implications for public policy and affects the structure and content of food control systems, ensuring they are tailored to achieve the national objectives effectively.

I.2.3. Measures to ensure Food Safety:

The Algerian legislator has shown increasing interest in food production due to market competition and commercial practices that compromise consumer health for quick profit. To ensure consumer safety and protection, it is essential to adhere to healthy food production practices, which include:

I.2.3.1. Hygiene of food products:

Food products must comply with health regulations throughout the production process to avoid any harm to the consumer. This involves

ensuring that food presented for consumption meets all sanitary requirements.

I.2.3.2. Hygiene of raw materials during harvesting and preparation:

Raw materials have to be protected from health hazards such as insects, waste, and residues. Attention must also be paid to the equipment and facilities used for collecting raw materials, as stipulated in (Article 03 of Executive Decree No. 91-3, 1991) Executive Decree No. 91-53.

I.2.3.3. Hygiene of personnel and food storage areas:

Personnel must maintain cleanliness, including their clothing and bodies, while handling food. This also applies to workers involved in the processing, transportation, or conversion of food products. Proper hygiene in these areas ensures consumer health stability and safety.

I.2.4. Food safety standards:

Food safety management standards, such as those developed by ISO, help organizations identify and control food safety risks while aligning with other ISO management standards. For instance, ISO 22000 provides global assurance in food production within the supply chain, facilitating the international movement of products and ensuring consumer trust.

I.2.4.1. ISO 22000 Food Safety standard:

The International Organization for Standardization (ISO) developed the ISO 22000 standard specifically for food safety within the food industry. This standard aligns with quality management systems such as ISO 9001 and environmental management systems like ISO 14001.

I.2.4.2. ISO 22001 Food Safety management system:

ISO 22001 is an international specification focused on delivering safe and secure food. It encompasses control and monitoring measures across the entire food supply chain, from the source (farm) to the final consumer's table. This standard is designed to prevent defects during food production processes and ensure high-quality food safety. As a result, an increasing number of distributors and supply chains seek certifications from independent bodies to guarantee the safety and quality of the food they sell. This not only enhances their reputation among consumers but also differentiates them from competitors (Al-Kabir, 2013).

I.2.4.3. Hazard Analysis and Critical Control Points (HACCP) system:

The HACCP system is a set of documented processes and procedures implemented by industrial organizations to ensure the production of safe food, free from any hazards that could compromise consumer health. The Algerian legislator has emphasized the application of HACCP through provisions outlined in the ministerial decree and Executive Decree No. 17-140. These measures aim to maximize consumer protection and minimize potential risks by focusing on preventive principles throughout the production, processing, and marketing chains.

II. Algeria's efforts in establishing Food Safety within the framework of Food Security:

Algeria, like other nations, has pursued food security, recognizing food safety as a fundamental component. The state has prioritized consumer protection and food safety.

In most countries, food control responsibilities are distributed among several agencies, which may have differing responsibilities. This often leads to overlaps in regulation, fragmented control, and coordination issues. Additionally, significant disparities may exist in expertise and resources among these agencies, potentially leading to conflicts between public health protection responsibilities and commitments to facilitate trade or develop specific industries or sectors.

Before addressing the measures necessary to ensure food safety, it is essential to understand the foundational elements upon which this factor relies within Algeria's food security framework.

II.1. The food situation in Algeria and influencing factors:

Achieving food security in any country is a critical issue that should not be left to external factors and changing circumstances. Instead, serious efforts must be made to ensure self-sufficiency, reducing poverty and hunger while identifying the causes of food deficits. Several key elements shape the strategic food reserve, as outlined below:

II.1.1 demographic factors:

Demographics play a significant role in the emergence of food challenges in many countries. Rapid population growth has led some nations to face a population explosion.

As of the end of 2023, Algeria's population reached 46.7 million, according to a recent report by the National Office of Statistics, with a

demographic growth rate of 1.52%. Projections indicate that the population will exceed 47.4 million by 2030 and surpass 60 million by 2050. This substantial increase will pose a significant challenge for Algeria in meeting the required quantities of food supplies.

II.1.2. natural factors:

Algeria faces several natural challenges that threaten its size in the medium and long term. These challenges include:

- Low proportion of arable land relative to total land area (Libri & Aissa, 2018, p. 139): In 1995, the cultivated area was 26,280.69 hectares. Over five years, this increased, reaching 28,226 hectares by 2000 and 2004. By 2005, the figure was 28,386.64 hectares, further expanding to 28,465.04 hectares by 2014. Recent years have thus seen a noticeable increase in arable land compared to earlier periods;
- Dependence of most agricultural activities on climatic factors, which fluctuate from year to year;
- Insufficient water resources: Most agricultural land in Algeria is not subject to regular irrigation due to water scarcity. In 2003, only 1.81% of total cultivated land was irrigated, increasing slightly to 2.19% in 2007 and 2.63% in 2013. This highlights the severe water deficit affecting Algeria's agricultural sector, negatively impacting productivity (Libri & Aissa, 2018, pp. 139-140).

II.1.3. Technological factors:

Technological advancement plays a vital role in human life, influencing economic, legal, social, and cultural aspects (Kafi, 2011, p. 09). In this context, technology refers not just to the equipment and machinery used in agricultural production but also to modern biotechnology, which helps optimize the use of water and agricultural soil (Al-Khetatna, 2015, p. 14).

Countries facing food insecurity often exhibit limited adoption of modern agricultural methods, which significantly contributes to low crop productivity, waste of natural resources, and challenges in addressing food deficits through capital-intensive agricultural expansion (Salam, p. 159).

II.1.4. Financial and material factors:

Despite the importance of the agricultural sector in developing countries, investment in this sector remains minimal. This underinvestment does not align with the sector's strategic significance,

whether in terms of its labor force or its demographic weight. Although global food availability is relatively sufficient, many developing countries cannot benefit due to low purchasing power (Aboube & Mellal, p. 16).

II.1.5. Political factors:

Several obstacles hinder countries' efforts to achieve food security, especially in light of recent global developments. Political issues directly impact a country's food situation (Boughedda, 2015, pp. 16-17). For instance, Algeria, despite its wealth of natural resources, was historically hindered by colonialism, which left lasting legacies that diverted focus from agricultural development.

II.2. Foundations for achieving Food Safety in Algeria:

Achieving food safety in any country requires establishing mechanisms to ensure compliance with the production of safe food. This involves enacting, enforcing, and protecting food safety measures legally and technically to prevent potential harm to consumers.

II.2.1. Legal foundations for food protection in Algeria:

Food safety legislation aims to ensure that food is safe and suitable for human consumption, preventing harm and fraud to protect public health. Effective implementation of these laws requires a robust administrative system and specialized bodies responsible for enforcing food safety regulations.

According to Article 65 of Law No. 09-03 on consumer protection, consumer protection and anti-fraud services can, under applicable legislation, temporarily suspend the activities of establishments or impose administrative closures of commercial premises for up to 15 days. These measures remain in effect until the causes are rectified, without prejudice to the penal sanctions stipulated in the law.

Presidential Decree No. 05-118, dated April 11, 2005, represents the first legislative text in Algeria dedicated to protecting consumers from the risks of food ionization. This subject was relatively new at the time, and the Algerian legislator did not address it until 2005. This decree assigns the task of determining the list of food products eligible for ionization to both the Ministry of Trade and the Ministry of Agriculture through an interministerial decision. It requires food irradiation facilities to comply with radiation protection standards, under an administrative license issued by the Atomic Energy Authority. Moreover, such facilities must employ highly qualified

personnel to carry out ionization processes, ensuring that the treated food remains free from radioactive contamination. Responsibility for any harm resulting from the ionization process lies with the operator of the irradiation facility.

II.2.2. Agencies contributing to Food Safety in Algeria:

Several agencies play a role in consumer protection, within the scope of their legal mandate. These include:

II.2.2.1. National Codex Alimentarius Committee:

Established in 2005 under the Algerian trade ministry (Executive Decree No. 05-67, 2005). It comprises representatives from various ministries, including Agriculture, Industry, Environment, Health, as well as consumer protection associations. The committee may also form specialized technical subcommittees to address specific topics, such as food products, additives, contaminants, and veterinary drug residues in food.

The committee's key roles include:

- **Advisory Role:** provides opinions on proposals from the Codex Alimentarius Commission of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). It gathers, studies, and organizes information related to Codex activities and facilitates consultations among stakeholders to ensure effective Algerian participation in Codex deliberations;
- **Awareness Role:** it initiates actions to improve food surveillance, based on indicators recommended by Codex for assessing food safety.

II.2.2.2. Algerian Center for Quality Control and Packaging:

In addition to managing the administrative operations of the Codex Committee, this center establishes inspection methodologies and sampling procedures for food products to protect consumers from potential food hazards. It operates specialized technical committees addressing various general issues, such as food hygiene (additives, contaminants, labeling, nutrition, and dietary products) and specific product categories like fresh or processed vegetables and biotechnology-derived foods.

II.2.2.3. National Health Security Agency:

This agency, reporting directly to the Presidency guidance, and alerts related to health security. According to Presidential Decree No. 20-435 (December 30, 2020) the agency periodically evaluates health

risks associated with biological and biotechnological substances, as well as nutrition.

II.2.2.4. Algerian Institute for Standardization (IANOR):

This institute is responsible for leading standardization activities to meet the evolving needs of economic actors. Established by Executive Decree No. 98-69 (February 21, 1998) and amended by Executive Decree No. 11-20 (January 25, 2011), the institute operates under the Ministry of Industry. Its responsibilities include:

- Developing and disseminating Algerian standards;
- Accrediting compliance marks for Algerian standards and quality marks, issuing licenses for their use, and monitoring their application.

II.2.2.5. Consumer Protection Associations:

In addition to the roles of official entities mentioned earlier, consumer protection associations also play a significant role in ensuring food safety, their activities regulated under (Law No. 31-90, 1990, p. 1438). They serve as a pressure group on the government, engaging directly with consumers who freely express their concerns and issues (Kahloula, 2018, p. 58).

These associations:

- Monitor markets and stores to ensure that food products comply with health specifications and standards;
- Analyze food samples to verify the absence of contaminants and harmful substances;
- Represent consumers in food safety-related cases, advocating for their rights before relevant authorities.

II.3. Development of Food Safety and Food Security Indicators in Algeria (2013–2023):

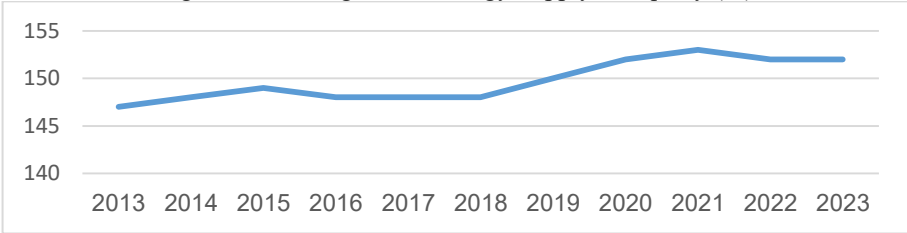
Various indicators and standards are employed to assess and determine the level of food security in a society. These indicators have evolved alongside the concept of food security (Khaznaji & Berkane, 2012-2013, p. 01). Understanding a country's food situation requires specific indicators that reflect its condition. In Algeria, some of the most commonly adopted indicators include:

Table 02: Food Security Indicators in Algeria (2013–2023)

Years	Average Food Energy Supply Adequacy (%)	Prevalence of Undernourishment (%)	Number of People Experiencing Food Insecurity (Million)
2013	147	2.9	3.1
2014	148	2.7	2.9
2015	149	2.6	2.7
2016	148	2.6	2.4
2017	148	2.5	2.6
2018	148	2.5	3.2
2019	150	2.5	3.4
2020	152	2.5	3.3
2021	153	2.5	3.3
2022	152	2.5	3.2
2023	152	2.5	3.3

Source: (Food and Agriculture Organization (FAO); World Health Organization (WHO), 2024).

Figure 02: Average Food Energy Supply Adequacy (%)

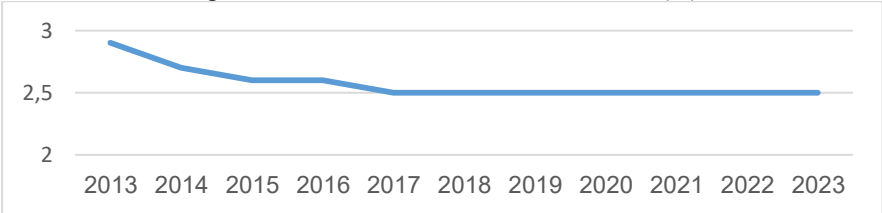


Source: prepared by the author.

This indicator reflects the availability of food at the national level and serves as a crucial metric for assessing the overall food security situation. It increased from 147% in 2013 to 149% in 2015, then slightly declined to 148% between 2016 and 2018. Subsequently, it rose annually, reaching 153% in 2021 before decreasing to 152% in both 2022 and 2023.

The gradual increase in the average adequacy of food energy supply over the years indicates an improvement in food availability at the national level.

Figure 03: Prevalence of Undernourishment (%)



Source: prepared by the author.

This indicator measures the prevalence of malnutrition among the population, serving as a crucial metric for individual health, particularly among children. The prevalence of undernourishment was 2.9% in 2013, decreasing to 2.5% in 2017, where it remained stable through 2023. Overall, while there has been fluctuation in the number of people experiencing food insecurity, the percentage of those suffering from undernourishment has remained relatively stable. This suggests that while the issue is not worsening continuously, it remains a significant challenge, especially with achieving Food Safety.

In the same context, to assess Algeria's efforts in implementing food safety standards, data on the acquisition of ISO 22000 certificates by food manufacturing enterprises in Algeria between 2012 and 2021 highlight the following:

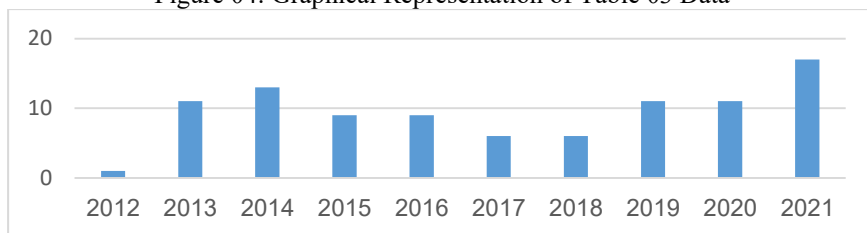
Table 03: Number of ISO 22001 Certificates Granted in the Food Industry in Algeria (2012-2021)

Years	Number of Certificates	Years	Number of Certificates
2012	1	2017	6
2013	11	2018	6
2014	13	2019	11
2015	9	2020	11
2016	9	2021	17

Source: (Bensdira & Bouhroud, 2023, p. 165).

Given the data presented in the table, the number of ISO 22000 certificates in Algeria remains very limited despite the government's increasing efforts to develop the food industry. These efforts include the aforementioned legal reforms and economic reforms aimed at supporting small and medium enterprises (SMEs) and private sector investment in this field.

Figure 04: Graphical Representation of Table 03 Data



Source: (Bensdira & Bouhroud, 2023, p. 166).

The graphical representation of the table data reveals fluctuations in the number of certificates in the food industry. The number rose significantly to 11 and 13 certificates in 2013 and 2014, respectively, compared to 2012. However, there was a decline in the number of

certificates between 2015 and 2020, followed by an increase in 2021, reaching 17 certificates.

Considering the level of adoption of this system within the Algerian business environment compared to global statistics, Algeria's adoption of the ISO 22000 system during this period remains very low.

Conclusion:

Food security and food safety are distinct yet interconnected and complementary concepts. While food security focuses on ensuring that all individuals have access to sufficient, nutritious food at all the time, food safety pertains to guaranteeing that food is free from contaminants and harmful substances that could endanger human health. Food safety is a shared responsibility among producers, distributors, consumers, and governments. To protect consumers and build a healthier society, Algeria has aligned itself with global reforms by implementing a set of legislative and regulatory frameworks aimed at ensuring food health and safety. Furthermore, the country has given consumer protection associations a crucial role in fostering a society.

Thus, the relationship between food security and food safety is complementary; food security ensures the availability of food, while food safety ensures that this food is safe for consumption.

Study Findings:

- Food security encourages local food production, reducing reliance on imported foods that may be contaminated or unsafe.
- Improving health and environmental conditions, which is integral to achieving food security, helps reduce food contamination.
- Efforts to achieve food security raise societal awareness about the importance of food safety and preservation methods.
- Both formal and informal bodies play a role in consumer protection.
- The average adequacy of food energy supplies has slightly improved over the years, reflecting better food availability at the national level.

In summary, food security lays the foundation for ensuring food safety, as it is difficult to achieve food safety without a stable and sufficient food supply.

Study Recommendations:

- The state should intensify efforts to raise awareness among traders and producers to provide better food protection for consumers.
- Strengthen oversight across the food supply chain.

- Develop a digital platform to facilitate the exchange of information with consumers, particularly in rural and remote areas.
- Equip regulatory bodies with dedicated laboratories to carry out their tasks more effectively, reducing dependence on distant facilities.
- Impose stricter penalties on anyone compromising food safety.
- Enhance the capabilities of governmental and academic institutions responsible for food safety, fostering better collaboration and coordination.
- Increase public awareness of food safety concepts through awareness campaigns and educational programs, including in schools.
- Promote international cooperation in food safety by participating in global agreements and protocols.
- Invest in data analysis technologies to predict potential risks and take appropriate preventive measures.

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