International Journal of Food and Agricultural Economics
ISSN 2147-8988, E-ISSN: 2149-3766
Vol. 10, No. 3, 2022, pp. 185-203

THE FOOD SECURITY OF ALGERIAN HOUSEHOLDS IN THE LIGHT OF THE COVID-19 PANDEMIC: AN EXPLORATORY STUDY

Zinelaabidine Touidjeni
Mohammed Seddik Benyahia University-Jijel, Department of Management, Algeria
Email: z.touidjeni @univ-jijel.dz¸ORCID: 0000-0001-6237-9755

Mohamed Seif eddine Boufalta
Abdelhamid Mehri University-Constantine 2, Department of Management, Algeria
ORCID: 0000-0003-0052-945X

Louiza Mebarki
Abdelhamid Mehri University-Constantine 2, Department of Management, Algeria
ORCID: 0000-0001-7483-1534

Abstract:

The study aims to survey a sample of Algerian households' opinions concerning their food security state under the COVID-19 pandemic. The electronic questionnaire was used as a tool for data collection. The study sample included 638 families distributed in 45 Algerian states. A set of results were reached, the most important are: the majority of households' opinions tended to highly agreed on the food commodities availability by relying mainly on national production during the COVID-19 pandemic period; families in the research sample weakly agreed to the stability of their supply of food commodities during the pandemic; the physical access to food commodities for families was affected differently, most families agreed moderately to their financial ability to obtain food commodities was weak compared to the period before the outbreak, the majority of the research sample agreed to a high degree to the quality and safety of food commodities obtained did not decline during this pandemic.
Keywords: *Algeria, assessment, COVID-19, food security, households.*
JEL Codes: *D10, O15, Q11, Q18.*

1. Introduction

Obtaining food is one of the issues that has preoccupied human thought since creation. During ancient times, there was a shortage of daily sustenance, which meant, at that time, the essence of the food problem was caused by a shortfall in food supply to meet demand. Nowadays, with the increase in the world's population and the development of living standards, the nature of the food problem and its causes have evolved to become more complex and intertwined, and that is what contributed to the emergence of the food security concept.

The food problem has not remained simple or confined to its availability. Rather, it exceeded it so that individuals could not obtain food financially and economically despite its availability. Many countries have an abundance of food while high prices have deprived the low-income and poor classes of meeting their needs. Moreover, the availability of food, along with the financial and economic capacity of individuals to acquire it, remains incomplete due to the lack of safe and healthy food and food supply instability.

Historically, the United States laid the foundation for the notion of food security to emerge during the Food and Agriculture Conference, held in Virginia in May/June 1943 under the leadership of "Roosevelt," during which he outlined four individual liberties, including freedom from want (Shaw, 2007). Donor agencies approved the notion of "a safe, adequate, and permanent food supply for each individual" at international levels, and the United States and Canada opted to dispose of their agricultural surpluses overseas (Weingärtner, 2005) The notion of food security first arose in the mid-1970s, when the emphasis was primarily on the problem of food supply, ensuring its availability, and controlling major food commodity prices and stability on a national and worldwide scale (Clay 2002). Analysts have advocated focusing on self-sufficiency as a strategy for achieving food security (Ashenafi, 2008). Between 1975 and 1991, there were more than 30 definitions of "food security" (Monfort, 2009), indicating the term's modernity and the difference in perspectives in its interpretation. A review of the evolution of the notion of food security reveals a shift from macro-quantitative to micro-qualitative concerns.

The instances of famine and malnutrition (1972-1974) drew the attention of numerous countries at the World Food Summit in 1975. Because no one anticipated a food catastrophe, 1969 was dubbed "the year of the great wheat glut" (Lappé & Collins, 1977) . The notion of "food security" emerged in the aftermath of the (1973-1974) worldwide food crisis, and it was documented as a new idea (Monfort, 2009), despite the fact that the right to food was recorded in the 1948 Universal Declaration of Human Rights (UN, 1949). The first notion of food security was centered on food supply, whereas the first explanation given by the FAO in 1975 concerned with the availability of a sufficient amount of food as well as the ability to obtain it nationally, and it was defined as: "The world's permanent capacity to supply basic commodities to support growth in food consumption" (PNUD, 2009). The solutions that emerged focused on improving production, setting national self-sufficiency goals, coordinating global food stocks, and implementing stable import policies (Stringer 2016).

Following the success of the Green Revolution (1980), which contributed to food production multiplication, it was recognized that food emergencies were caused by a sharp decline in the purchasing power of specific social groups, rather than a catastrophic shortfall in food production; thus, the concept of food security has been expanded to include financial and economic access to food (Weingärtner, 2005). At this point, the idea of food security shifted away from quantitative macro considerations to focus on how to meet demands at the household level. Amartya San's 1981 famine literature, and subsequently a series of FAO reports, led to the move from macro to micro-level analysis (Stringer 2016). Another definition of food security was developed in 1983 as "ensuring the financial and economic access ability of all individuals to the basic foods they need" (FAO, 1983). The World Bank defines it as "access by all people at all times to sufficient food needed for an active and healthy life; its essential elements are the availability of food and the ability to acquire it (Clay, 2002; WB 1986). It was then enriched to mean "ensuring that all individuals have access at all times, socially, economically, and financially, to sufficient, safe, and nutritious food that meets their nutritional needs and food preferences for an abundant, healthy, and active life" (Ecker & Breisinger, 2012), so the focus became on a balanced diet system, especially under the growing nutritional concerns (Monfort, 2009).

The globe was shocked by the advent of the Covid-19 virus towards the end of 2019, which caused a significant disruption in numerous economic sectors and industries. This global pandemic is first and foremost a health crisis, but its impact extends far beyond the health sector, with consequences felt in all economic and social sectors (NU 2020). According to FAO, the Covid-19 pandemic is a worldwide crisis that is already hitting food security by affecting the whole food system, from primary supply to processing trade, national and international logistics systems, and intermediate and final demand (FAO 2020a).

Algeria, with an area of 2,381,741 km², is the largest country in Africa since the split of Sudan. The desert (Sahara) covers more than 84% of the area, along approximately 2 million kilometers, while arable land accounts for 8.5 million hectares, or slightly more than 3.5% of this area, and 19.7% of the total agricultural area ((Bessaoud et al., 2019). Algeria has worked for a long time since its independence attempting to achieve food self-sufficiency in order to sever all dependence on the outside, especially France, and has embodied many programs to achieve this goal, the most important of which is the agricultural revolution program in 1971 under the slogan "The land to those who serve it" (Sutton 1974). In 2000, Algeria officially adopted the concept of food security, and it was featured in several formal documents issued by the Ministry of Agriculture at that time (Bouazouni, 2008). Despite its human resources, natural richness, and the significant efforts to enhance national agricultural food production, it remains dependent on abroad for major food commodities, endangering its food security, notably the availability and stability of food supply.

The purpose of this paper is to explore the food security of Algerian households in light of the Covid-19 pandemic. Most of the studies that discussed the state of food security relied on secondary sources represented in the outputs of international organizations' databases such as the Food and Agricultural Organization and the Economic Intelligence Unit, as well as data from some Algerian bodies, such as the Ministry of Agriculture and the National Bureau of Statistics. On the other hand, the e-questionnaire used in this study, collected data from its primary source (the households). In addition, there have been few studies that assess the food security situation in Algeria in light of the Covid-19, which was conducted during the difficult circumstances and exceptional measures that Algeria, like other countries around the world, went through as a result of the quarantine procedures and its significant impact on the ordinary course of economic activities, especially imports, the mobility of individuals, as well as the stability of the income levels. Through this article, we will endeavor to achieve the following objectives: (1) providing an objective assessment of the food security state of Algerian households in the light of the COVID-19 pandemic; (2) identifying the consumer behavior of Algerian households in the light of the COVID-19 pandemic; (3) alerting Algerian decision-makers to the weaknesses in the food security state of households in the light of this pandemic; and (4) assessing the ability of Algerian households to cope with crises.

2. Theoretical Framework

2.1 Literature review

Covid-19, also known as the coronavirus, is a respiratory illness that has spread swiftly and globally since late 2019 (Sharma et al., 2020). Recent and ongoing crises, particularly ones having global ramifications, are likely to have an impact on global trends (FAO et al., 2022). The pandemic has had profound implications for the worldwide population's health and well-being (Rahman et al., 2022). Because of the initial and ongoing uncertainty surrounding the nature of Covid-19's spread, a number of countries implemented strict lockdown and physical distancing rules. These measures slowed economic activity significantly and disrupted supply chains (HLPE, 2020). This triggered a global economic recession, resulting a widespread job and income losses (Naidoo & Fisher, 2020). According to World Health Organization estimations, the full death toll associated directly or indirectly with the Covid-19 pandemic between January 1st, 2020 and December 31st, 2021 was approximately 14.9 million (WHO, 2022). Many people have been laid off. And according to the International Labour Organization, more than 400 million full-time jobs were lost in the second quarter of 2020, assuming a 48-hour workweek, due to a number of governments adopting lockdown measures (ILO, 2020).

Given that food security and safety are critical components impacted by economic crises, the economic and agricultural implications of Covid-19 have prompted serious concerns about global food security (Han et al., 2021). This epidemic threatens millions of people's food security and nutrition, many of whom were already suffering (UN, 2020). Economic disruption caused by the pandemic-control measures reduced physical and economic access to sufficient and nutritious food, resulting in a wider spread of hunger and malnutrition, a lack of dietary diversity, and malnutrition-related disorders worldwide (Fan et al., 2021). Global hunger rose to 828 million in 2021, an increase of about 46 million since 2020 and 150 million since 2019, before the outbreak of the Covid-19 pandemic. Furthermore, almost 3.1 billion people could not afford a healthy diet in 2020, and up to 112 million from 2019, reflecting the effects of inflation in consumer food prices stemming from the economic impact of the Covid-19 pandemic and the measures put in place to contain it (FAO et al., 2022).

The economic consequences of Covid-19 on food security tend to be greater in low- and middle-income countries (Picchioni et al., 2021). The Covid-19 pandemic's supply chain disruptions and ongoing economic fallout are reversing years of development gains and pushing food prices to all-time highs. Individuals in low- and middle-income countries are more affected by the rising prices since they spend a larger share of their income on food than people in high-income countries (WB, 2022). The Covid-19 has a significant impact on perishable food and food shortages in poor war zones. Additionally, the Covid-19 posed a threat to food security in several developed countries as well as the majority of developing countries, particularly those suffering from food dependency (Mouloudj et al., 2020). The spread of the Covid-19 virus had a huge impact on the food system worldwide, with direct and indirect consequences on people’s lives and the livelihoods, along with changes in public policies. Some of these consequences are still manifesting themselves over time, and the poorest and most vulnerable communities will bear the brunt of the virus's spread (Mardones et al., 2020).

On February 24th, 2020, Algeria announced its first case of Covid-19**.** From January, 3rd 2020 to July, 3rd 2022, 266,772 confirmed cases of Covid-19 were reported to WHO, with 6,876 deaths (WHO 2022). This crisis afflicted the population in Algeria, as it did in other countries, by affecting the normal course of economic activities. Algeria is highly vulnerable to demand risk due to its relatively high share of food expenditure and relative dependence on food imports (FAO 2020a). This puts the availability and stability of the food supply at a serious risk. It imported about 4 million tons of food products in the last ten years, mainly cereals, milk, juices, and fruits. The average amount of this bill is around 9 billion USD (Bouchentouf & Benabdeli, 2021). Cereals are the most imported food items, accounting for between 31 and 38 percent of total food import bill each year (Rahal & Tahri, 2022). The proportion of local consumption that is dependent on imported cereals exceeds almost 70% (FAO 2020a). Algeria's wheat requirement is estimated to be 88 million quintals to meet the demand of 44 million people. National production is about 22.5 million quintals, or approximately 74%, of which is covered by imports (NU 2020).

Besides, despite the large financial envelopes that Algeria allocates annually to social subsidies in general, which increased from 315 billion dinars in 2001 to 1,760 billion dinars in 2018, and 1,942 billion dinars in 2022, an important portion of it is directed to support food commodity prices, particularly milk, sugar, flour, and oil (Hami 2022). According to reports and studies, Algerian households are experiencing a decrease in their purchasing power to obtain food commodities as a result of the recorded inflation, which is 4.6% between 2015 and 2021 (IMF, 2022), as well as the problem of speculation during the pandemic period, especially during religious occasions such as the month of Ramadan (USDA 2020; Mouloudj et al., 2020). Furthermore, the high volume of their food expenditures, since the Algerian household devotes about 45% of their budget to food basket, plainly reveals a lack of purchasing power (Chaib, 2019).

2.2 The Problem of Assessing Food Security

Assessment means judgment, measurement, and estimation aimed at understanding a certain situation, and deciding whether or not to interfere... There are 02 ways to do that, the 1st is to rely on it as means to develop a specific program (if necessary), The 2nd is centered on its use as monitoring or evaluating of an existing program and adjusting it according to circumstances and needs (FISCRCR, 2005). A good understanding of the food security foundations is a crucial factor to be able to follow up its status in the community under study.

2.2.1 The (FAO) Model

Table 1. Food Security Assessment Indicators of the FAO

Axis	Food Security Indicators Settings
Availability	- Adequacy of the average food energy supply. - Average value of food production. - Share of nutritional energy supply from grains, roots and tubers. - Average supplies of the animal source of proteins.
Access	- The ratio of paved roads to the total roads. - Road density. -Railroad density. - Gross domestic product per capita as purchasing power equivalence, - Domestic food price index. - Prevalence of undernourishment. - Share of food spent by the poor. - Depth of food deficit. - Prevalence of food insufficiency.
Stability	- The percentage of dependence on imports of grains. – The percentage of arable land equipped for irrigation.- The value of food imports compared to the total exports of merchandise.- Political stability and the absence of violence/ terrorism.- Local food prices volatility.- The difference in food production per capita.- Different food supplies per person.
Utilization	- Access to improved water sources. - Access to improved sanitation facilities. - Percentage of children under five years of age suffering wasted, stunted, and underweight. - Percentage of adults suffering underweight. - Prevalence of anemia In children under five years of age.- Prevalence of vitamin A deficiency.- Prevalence of iodine deficiency.

Source: (FAO, 2020a).

The first initiative in internationalizing the use of a system of food security indicators state assessment was launched in 1997 by the Committee on World Food Security of the FAO, and it included technical consultations to harmonize the use of indicators for assessing the state of food security in the world. Food Security, vulnerability and related mapping (SICIAV) (FAO 2000). The (FAO) provides a database that allows access to the indicators under the name "Food Security Index", which includes 30 indicators for 204 countries of the world (FAO, 2020b). Table 1 illustrates it:

It is clear from Table 1 that the FAO relies upon assessing the state of food security on a system of criteria that includes 04 pillars and a set of indicators to which it belongs. The system of criteria and indicators used is characterized by the fact that it is based on internationally accepted methods for assessing the extent, the severity, and the range of the poor nutritional state, and diagnosing the most affected groups (FAO, 2020b).

2.2.2 Economist Intelligence Unit Model (EIU)

It was established in 2012, it provides 28 individual quantitative and qualitative indicators to assess the state of food security for 113 countries, within 03 main axes. This body publishes what is known as the Global Food Security Index on an annual basis. It derives the data it uses from several international bodies such as the FAO, the International Institute for Nutrition Policy Research, the WHO...etc. It is characterized by great accuracy in assessing the level of food security, relies on giving scores of 100 points on the state of food security for each country (EIU, 2021). Table 2 illustrates the indicators within each axis.

Table 2. Indicators of the Food Security Assessment of the EIU

Axis	Indicators System Relied on
Affordability of Food	- Food consumption as a percentage of household expenditures. - Percentage of the population below the poverty line ($2/per person/day as purchasing power equivalent).- Average GDP per capita.- Customs tariffs on agricultural imports.- Existence of food safety net programs. Farmers' access to finance.
Food Availability	- Average food supply. - Dependence on food aid. - Government spending on agricultural research. - Availability of adequate storage stores for agricultural crops. - Road infrastructure. - Port infrastructure. - The fluctuation of agricultural production. - The danger of political instability. Corruption. - Food losses. - Carrying capacity in urban areas.
Food Quality and Safety	- Diet diversity. - Nutritional standards: the existence of a national nutrition guide; The presence of nutrition control and monitoring. - Availability of micronutrients: availability of foods containing vitamin A; Availability of foods containing animal iron - Availability of foods containing vegetable iron. - Quality of protein. - Food safety: the presence of an agency to ensure the safety and health of food; Proportion of the population with access to safe water; Existence of a formal grocery sector

Source: (EIU, 2021).

The system of indicators that can be relied upon can vary from one country to another due to its different implications. The poverty line estimated by EUI at $3.20/per person/day, as an indicator of the group's economical inability to obtain food, which does not translate the reality in some countries. The researcher must select the appropriate system in line with the specifics of the study sample.

3. The Field Framework of the Study

3.1 Method and Tools

The electronic questionnaire was relied on to collect data during the year 2021. This type of tool provides a set of advantages compared to the paper questionnaire, or other methods that are conducted face-to-face, the most important of which are: comprehensiveness, low costs, digital data collection, which speeds up and facilitates its processing from the researcher , also on the other hand, the use of this tool knows a set of restrictions, especially: its limitation to those who are proficient in using the keyboard and the Internet, which poses the problem of generalizing the findings (Wyatt, 2000).

We relied on the descriptive and analytical approaches in collecting data that describe, analyze, organize and elicit interpretations of study variables. We relied in building the e-questionnaire statements (appendix 1), on the Food Security Indicators (FAO, 2020b) and the Global Food Security Index (EIU, 2021). The study was divided into 02 parts. The 1st aimed to collect social and demographic data. The 2nd assessed the household's food security state. it included 13 phrases distributed on 03 axes according to the 5-points Likert scale. To analyze the answers, we used SPSS.V22, the means (M) and standard deviations (SD) were calculated. To verify the internal consistency of the questionnaire axes, we calculated the reliability coefficient "Cronbach Alpha", and we got the results shown in the following Table 3:

Table 3. Reliability Analysis

Study axes	Phrases number	Stability
03	14	0.713

Note: "Cronbach's Alpha" was greater than 0.5, so the questionnaire is reliable and highly stable.

3.2 Study Population and Sample

The study population is represented in the total number of Algerian households estimated to be 7.45 million households. We have determined that based on the total population of Algeria, estimated according to the data of the National Statistics Office in January 2021, at 44.7 million people (ONS 2020) divided by the average number of household members, equal to six (06) members (ONS 2014; UN 2017). Surveying the whole community is difficult so we relied on simple random sample, its size calculated according to the (Thompson, 2012, pp. 59-60) formula:.

$$n = \frac{Np(1-p)}{(N-1)\left(d^2/Z^2\right)+p(1-p)} = \frac{7300000\ 0.5(0.5)}{(7300000-1)\left(0.05^2/1.96^2\right)+0.5(0.5)} \cong 384$$

Where: n: Sample size; N: Community size; Z: The standard score corresponding to the significance level 0.95 and equal to 1.96; d: Error rate equal to 0.05; p: The ratio of the availability of the characteristic and the neutral is equal to 0.50.

The same sample size can be obtained by relying on the table commonly used to calculate the sample by researchers "Krejcie" and "Morgan", in which they summarized that the sample size with an estimated number of 384 individuals is suitable for a research which population exceeds one million individual (Krejcie & Morgan 1970). It is also possible to rely on the researcher "Roscoe" study, in which he explained the "basic rule" to determine the appropriate sample size for generalizing the results of the study to a whole community, as he considered that the sample size, which ranges between 30 and 500 individuals, is considered appropriate for most types of research (Roscoe 1975). During the period from January 1, 2021, to January 1, 2022, 638 responses were received from the households, distributed over 45 Algerian states (appendix 2), all of which were approved as valid forms for the study, which is an appropriate sample size for generalizing the results of the study to the community as a whole.

3.3 Discussion and Results

From January1st, 2021, to January 1st, 2022, 638 responses were received from the households distributed over 45 Algerian states approved as valid.

3.3.1 The Characteristics of the Study Sample

The sample included many household sizes, the largest was 05 members or more with 54.5%, followed by 04 members with 25.9%, while households with only 02 members were 4.2 %. Large households are often more diversified in terms of food commodities needs and under much greater financial pressure during the COVID-19 pandemic. The results in Table 3 illustrates 234 (36.68%) providers worked in the education sector in all its phases, followed by the public administration sector, health, social work, the national defense sector with 20.68%, 9.56% and 7.22% of the total number of employees. We point out that the results showed that 269 households have only one provider, representing 42.2% of the sample size, 125 household providers work in the education sector, equivalent to 19.59% of the research sample size. More than 74% of the households work in the public sector. Concerning the household monthly income level, the largest group was 46% in size, its income level starts from 60.000 DA per month, of which 31.7% of the households have a monthly income greater than 80.000 DA, bearing in mind that the household average monthly income in Algeria estimated at 58.400 DA for the public sector and at 34,100 DA for the private sector (ONS, 2019). Only 40 households, representing 6.3% received a monthly income less than the national minimum wage estimated at 20,000 DA, which is the category that is more likely to be exposed to great financial pressures. We have tried to divide the assessment into 03 axes:

Table 3. The main Characteristics of the Study Sample

Variables	Category	Frequency	Percentage (%)
Household member numbers	Two individuals	27	**4.2**
	Three individuals	99	**15.5**
	Four individuals	165	**25.9**
	Five individuals and more	347	**54.4**
Employee members in the household	One employee	269	**42.2**
	Two employees	250	**39.2**
	Three employees and more	106	**16.6**
	None	13	**2.0**
The households provider/ providers	Education	234	**36.68**
	Public administration	132	**20.68**
	Healthy and social work	61	**9.56**
	National defense	46	**7.22**
	Other activities	165	**25.86**
Monthly household income level	Less than 20000 DA	40	**6.30**
	[20000DA -40000 DA[	165	**25.9**
	[40000DA -600000 DA[	140	**21.8**
	[60000 DA -80000 DA[	91	**14.3**
	80000 DA and more	202	**31.7**

Source: Prepared by researchers based on the outputs of the SPSS software.

3.3.2 The Availability and Stability of the Supply of Food Commodities

Availability means the physical availability of food commodities for all, and it includes an adequate supply of food commodities in a manner that meets the needs of all from national agricultural productivity, distribution, import, and appropriate local or national policies (Riely,

1999). Whereas stability/ sustainability refers to the chronological (short, medium and long term) aspect of food security (Weingärtner, 2005). To ensure that individuals have access to food without being threatened by the emergence of political, economic, or climatic crises (ACFI, 2011) and health crises: lockdowns and quarantine. Table 4 summarizes the results of respondents' opinions on the 1st axis.

Table 5 discerns that the degree of approval on the statements of the first axis is weak, so that M=2.84, with SD= 0.43, which indicates that there are no differences in the opinions of the study sample households. By further analyzing the outputs of Table 4, we distinguish the following:

- Phrase (01): it appears that most of the research households' opinions tend to "Agree", given the M= 3.7 which indicates highly agreement on food commodities availability compared to before the outbreak. The SD=0.81 indicates the surveyed households' answers are not scattered from the mean, as they fully agreed with the content of the phrase, 401 households, 61 households representing 62.9%, 9.6% of the sample size.

- Phrase (02): illustrates that the majority of the opinions tend to "Agree", given that M= 3.78, which indicates that the research sample highly approves that nationally produced food commodities are available the same as before the outbreak. The SD=0.90 indicates that the respondents' opinions are not dispersed from the mean, as 386 households agreed and 100 households fully agreed on the content, representing 60.5% and 15.7%.

- Phrase (03): it is clear that the majority of the research sample tend to "disagree", given the M= 2.11, which indicates that the households weakly agree on the availability of imported food commodities was at the same level compared to before the outbreak. The SD=0.96 indicates that the respondents' opinions are not dispersed, as 392 (61.4%) households disagree and 136 (21.3%) households did not fully agree with the content.

The available supply of food commodities in its simple form consists of the volume of national (domestic) production destined for the national market plus imports. The majority of the opinions tended to agree on the availability of food commodities during the pandemic, most of them agreed on the availability of nationally produced food commodities and disagreed with imported food commodities supply not retracting. The decline in imported goods volumes is due to the shutdown conditions known internationally, plus to the contribution of imported food commodities.

- Phrase (04): it emerges that most of the research sample households tend to "Disagree", given the M= 2.46, which indicates that the research sample weakly agreed on providing food commodities stability during the COVID-19 pandemic. The value of the SD=0.93, which is a sign of the concentration of the respondents' opinions, as 313 households disagree representing 49.1% of the sample size. 180 households (28.2%) of the research sample size, somewhat agreed, indicating that these households knew relative/ circumstantial instability in their supply of goods during the COVID- 19 pandemic.

- Phrase (05): illustrates that most of the opinions of the households tend to "Disagree", given the M= 2.12, which indicates that the research sample households weakly agree to not being

Table 4. Results of the Availability and Stability of Food Commodities Supplying during the COVID-19 Pandemic Phrase Access

Statement / Phrases of Availability and Stability of Food Commodity Supply Axis		Totally agree	Agree	Agree somewhat	Disagree	Totally Disagree	M	SD
Food commodities did not know a decrease in their availability compared to the period before the outbreak of the Covid-19 pandemic	**f**	61	401	119	43	14	3.70	0.81
	%	9.6	62.9	18.7	6.7	2.2		
The supply of nationally produced food commodities has not known a retraction during the COVID-19 pandemic period	**f**	100	386	88	42	22	3.78	0.90
	%	15.7	60.5	13.8	6.6	3.4		
The supply of imported food commodities has not known a retraction in the market during the COVID-19 pandemic period.	**f**	27	46	37	392	136	2.11	0.96
	%	4.2	7.2	5.8	61.4	21.3		
My household has not suffered instability in the supply of food commodities during the period of the COVID-19 pandemic	**f**	28	50	180	313	67	2.46	0.93
	%	4.4	7.8	28.2	49.1	10.5		
My household did not at all times face the problem of not being able to get all their food needs during the COVID-19 pandemic period	**f**	21	40	86	344	147	2.12	0.94
	%	3.3	6.3	13.5	53.9	23		
Availability and stability of food commodity supply axis	**f**	237	923	510	1134	386	2.84	0.43
	%	7.5	28.9	16	35.5	12.1		

Source: Prepared by researchers based on the outputs of the SPSS software.

able to get at all times their needs of food commodities during the pandemic, the SD=0.94. 344 (53.9%) households disagree and 147 (23 %) households did not fully agree.

Most of the households disagree on the stability of the food commodities supply, they disagree on not being able to obtain at all times their needs of food commodities during the pandemic. The orientation of the respondents can be explained from several aspects are households facing the problem of disruption of food supplies due to the period of a partial and total quarantine imposed by the state as a preventive measure during 2021, which prevented them from obtaining goods at all times; disruption of imported food supplies due to the closure of the main domestic food commodities or the raw materials from which they are made like: milk, oil, sugar, wheat ... etc. Major food commodities like oil, flour,.. etc. subjected to monopoly and speculation.

3.3.3 The Ability to Obtain Food Commodities

The ability to have access consists of 02 parts: physical indicators including infrastructure level: railways, road and market density...etc. Economic indicators, include: food prices, individual incomes (FAO 2014). In some cases, food may be physically and economically available to consumer however, because he is a member of a particular social group, he cannot afford to obtain it (Riely et al., 1999). The ability to obtain includes 02 parts, material related to the logistics and infrastructure dimension and economical related to the availability of sufficient financial resources to meet needs affected by many variables: food prices and incomes…etc. Table 5 illustrates the results of respondents' opinions.

Table 5 illustrates a medium approval degree for the 2nd axis statements, the M= 2.88, with SD=0.87, which indicates that there are no differences in opinions.

- Phrase (01): it is clear from Table 5 that most of the households tend to "Somewhat agree", given the M= 3.3, which indicates that the sample households agree moderately that the quarantine measures imposed by the state during the Covid-19 pandemic did not make it difficult for them to move to obtain food commodities from stores and/or markets. In total, 47.5% of the households agreed. In contrast, 26.5% of them did not agree, and 26% somewhat agreed, with SD=1.23 demonstrating a dispersion in the households' answers. This variance can be explained by the different impact of the economic access to food commodities for the households, as the quarantine procedures taken varied from one state to another since the study contained of 45 Algerian states, also the differentiation between the municipalities within in terms of infrastructure levels.

- Phrase (02): Most of the opinions of the sample tend to "Somewhat agree", given the M= 3.1, which indicates that the households agreed moderately to their weak economic access to food commodities compared to the period before the outbreak. 42.9% agreed, 36.5% of them disagreed, and 20.8% somewhat agreed, which was reflected in the SD=1.23, which expresses the dispersion of answers.

Table 5. Results of Food Commodities during the COVID-19 Pandemic Access Axis

Statement / Phrases of the Ability to Access Food Commodities Axis		Totally agree	Agree	Agree Somewhat	Disagree	Totally Disagree	M	SD
The quarantine measures imposed by the state during the COVID-19 pandemic did not make it difficult for my household to move to get food commodities from stores and/or markets	**f**	128	175	166	111	58	3.3	1.23
	%	20.1	27.4	26	17.4	9.1		
My household's economic access to obtain food commodities has not diminished compared to the period before the outbreak of the COVID-19 pandemic	**f**	114	158	133	160	73	3.1	1.28
	%	17.9	24.8	20.8	25.1	11.4		
My household spending value on the food basket has not increased compared to the period before the outbreak of the COVID-19 pandemic	**f**	102	135	147	177	77	3.01	1.27
	%	16	21.2	23	27.7	21.1		
I don't think that the length of the COVID-19 pandemic will weaken my household's economic access to get their food commodities.	**f**	21	51	65	332	169	2.09	0.98
	%	3.3	8.0	10.2	52.0	26.5		
The ability to obtain food commodities axis	**f**	403	583	568	666	332	2.88	0.87
	%	15.8	22.8	22.2	26.1	13.1		

Source: Prepared by researchers based on the outputs of the SPSS software.

This variance can be explained by the different impacts of the economic access to food for the households, 31.7% of them receive more than 80. 000 DA per month and 25.9% receive between 20. 000 and 40. 000 DA per month.

This can be explained by the limited response of these households' incomes to the recorded increase in food commodity prices. During this period, Algeria recorded a sharp increase in food commodities prices from 1.8% in October 2020 to 14.4% in October 2021, and a significant increase in fresh agricultural products prices, which increased in October, 2021 by 16.5% compared to 1.9% in the same month for the previous year (BA, 2021).

- Phrase (03): The majority of the opinions tend to "Somewhat agree", given M= 3.01, which indicates that the households agree moderately that the spending value on the food basket would not increase compared to the period before the outbreak. The value of the SD=1.24 reflects the dispersion of opinions from the mean, 294 households disagreed, representing 39.8% of the sample size, corresponding to 237 households who agreed with, equivalent to 37.2% of the sample size, 23% of the households somewhat agreed. The agreement of 39.8% of the research households on the increase in their expenditures on food commodities can be explained from 02 aspects: the 1st is the change in the consumer behaviors, so that their storage rates for main food commodities such as flour, oil and sugar increased due to the temporary scarcity imposed by the COVID-19 pandemic generating a state of fear; the 2nd is that these households were affected by the high prices of food commodities, as we mentioned earlier.

- Phrase (04): Most of the opinions tend to "Disagree", where M= 2.09, which indicates that the research sample households believe that the length of the COVID-19 pandemic will weaken their financial capabilities to obtain their needs of food commodities. The value of the SD=0.98, demonstrates the concentration of the opinions around the mean, as 501 (78.5%) households disagree. Food may be available, however, the individual cannot obtain it financially due to the poor transportation and distribution networks, or they cannot economically due to the limited response of their income to the elevation in prices of food commodities, causing consumption patterns and managing expenses changes. Algeria has pursued a policy of price social support to preserve the purchasing power of individuals, however, many published studies and statistics have illustrated that the size of what rich or high-income households spend on consumption is 03 times what the disadvantaged or poorest households spend (ONS, 2015). Thus, it can be said that low-income and poor households are not the only or largest beneficiary of social support funds for the main food commodities.

3.3.4 Quality and Safety of Food Commodities

This embodies the nutritional dimension of food security, meaning the availability of safe and nutritious food that responds to individuals' needs. It also means the necessity of providing adequate food balance that meets the physical needs of individuals to ensure a healthy and active life, it also includes a conducive healthy environment (water and sanitation) (PNUD, 2009). Its evaluation includes a wide range of indicators: the diversity of the diet, nutrients such as proteins, vitamins, and salts; Outputs resulting from the use of food, stunting, underweight, anemia; and the individuals' ability to access safe water and sanitation index as an indicator of an appropriate healthy environment...etc. (FAO 2014). Table 6 illustrates the results of the research sample opinions on the 3rd axis:

The general tendency of the households is high approval to the content of 3rd axis phrases, given the value of M= 3.9 And the mean of the phrases (01), (02), (03) and (04), were 3.9, 3.8, 3.9 and 4.07. The SD for each statement was 0.91, 0.91, 0.97, and 0.98.

Table 6. Results of the Food Commodities Quality and Safety Obtained during the COVID-19 Pandemic Phrases Axis

Statement / Phrases of Food Commodities Quality and Safety Axis		Totally Agree	Agree	Agree somewhat	Disagree	Totally Disagree	M	SD
My household gets all its nutrients (proteins, vitamins, salts...) during the COVID-19 pandemic period	**f**	157	376	47	39	19	3.9	0.91
	%	24.6	58.9	7.4	6.1	3.0		
My household did not suffer from nutritional deficiency diseases (stunting, wasting, underweight...) during the COVID-19 pandemic period	**f**	116	389	79	27	27	3.8	0.91
	%	18.2	61	12.4	4.2	4.2		
My household's consumption of food commodities of starchy origin (cereals, roots, tubers, potatoes...) did not increase during the COVID-19 pandemic period	**f**	164	354	50	48	22	3.9	0.97
	%	25.7	55.5	7.8	7.5	3.4		
My household's access to safe water has not been affected compared to the period before the outbreak of the COVID-19 pandemic	**f**	243	274	66	33	22	4.07	0.98
	%	38.1	42.9	10.3	5.2	3.4		
Quality and safety of food commodities axis	**f**	680	1393	242	147	90	3.9	0.61
	%	26.6	54.6	9.5	5.8	3.5		

Source: Prepared by researchers based on the outputs of the SPSS software.

58 households, representing 9.1% of the sample size, disagree on obtaining all their needs of nutrients (proteins, vitamins, salts...) during the pandemic period (phrase 01). In general, 54 households (8.4%) disagree of their members not suffering from nutritional deficiency diseases (stunting, wasting, underweight...) during the pandemic (phrase 02). the results of the 2nd statement confirm the orientations of households in the 1st statement. 70 households, equal to 10.9% disagree on the increase of starchy food origin consumption (cereals, roots, tubers...).

during the pandemic. Also, 55 households (8.6%) disagree on their ability to access safe water was affected compared to the period before.

The prevalence of undernourishment in Algeria - despite its weakness - in light of the abundant supply of food commodities, can be attributed to the low purchasing power of poor and low-income households meets the medium and minimum food needs of their members, as well as the weak purchasing power of these households makes them tend to consume food of starchy origin, which is considered cheaper, versatile and contains beneficial nutrients. The decline in food quality and safety despite its low relative importance in Algeria, with the unsafe health environment such as polluted water and sewage, will subsequently bear high economic and social costs (employees' weak productivity, the spread of poverty, high rates of diseases associated with undernutrition and early death rates).

4. Conclusion

Algerian households during the COVID-19 pandemic achieved food security. The physical access to obtain food commodities for the households was affected differently, the quarantine did not make it difficult for them to move to obtain food commodities from stores and/or markets. We attributed this to the different quarantine procedures taken from one state to another since the study included 45 Algerian states, as well as the differentiation of the municipalities within at the infrastructure level (density of transportation, and of stores and markets). The economic access to food for these households was affected at varying rates, that was because of (05) wages groups. The households' income response to the recorded prices hike of food commodities is limited, due to prices speculation of main commodities. The households increased their expenditures on food commodities (39.8%). This attributed to the change in the households' consumer behaviors and to storage caused by the general fear of scarcity during the Covid-19 pandemic. Algerian social support policy pursued of main food commodities: milk, sugar, grain, and table oil is not for poor and low-income households, it benefits instead social groups from high-income households, merchants, and factory owners, therefore, policy amendment is required while maintaining the food safety and quality.

Algeria should pay more attention to support the physical and economic capacity of individuals to obtain food commodities, as there may be an availability of food without meeting needs, and this is proven by the reality of many countries, here we find that the income distribution in society and price support policies are among the most influential factors. Therefore, the availability of food with the individual's ability to obtain it economically remains deficient in the light of the possibility that the state not having a sufficient food stock or weak distribution networks and transport so, the access to food in some areas still difficult.

Acknowledgements and Funding

The researchers thank all expert professors from the Universities of Constantine and Jijel in Algeria for their great efforts in checking the questionnaire, as well as for all the valuable comments they provided us about the study. This work would not have been possible without the spirit of cooperation of the three researchers, as each contributed diligently and responsibly to its production.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

ACFI. (2011). Surveillance de la sécurité alimentaire et des moyens d'existence: un guide pratique pour les travailleurs de terrain. Canda; France: ACFI.

Ashenafi, G. C. (2008). Triticale production in Ethiopia-its impact on food security and poverty alleviation in the Amhara Region. Germany: University of Kassel, Faculty of Organic Agriculture Scien.

BA. (2021). Présentation de Mr le Gouverneur de la Banque d'Algérie. Algeria: Bank of Algeria.

Bessaoud, O., Pellissier, J.-P., Rolland, J.-P., & Khechimi, W. (2019). Rapport de synthèse sur l'agriculture en Algérie. Montpellier: CIHEAM-IAMM.

Bouazouni, O. (2008). Étude d'impact des prix des produits alimentaires de base sur les ménages pauvres algériens. Caire : WFP.

Bouchentouf, S., & Benabdeli, K. (2021). Water resources and food security in Algeria: Diagnosis and new strategy proposition, *African Journal of Agricultural Research*, 17(3), pp. 414-424.

Chaib , B. (2019). The Question of Food Security in Algeria: Between the Collapse of Petrol Price and the Growing Needs of the Population, *Advances in Economics and Business*, 24-30.

Clay, E. (2002). Food security: Concept and measurement. FAO expert consultation on trade and food security: conceptualizing the linkages. Rome, Italy: FAO.

Ecker, O., & Breisinger, C. (2012). The food security system: a new conceptual framework. Washington, D.C: IFPRI.

EIU. (2021). Global Food Security Index 2020. Retrieved Decembre 10, 2022, from The Economist Intelligence Unit: http://foodsecurityindex.eiu.com/Home/DownloadIndex

Fan, S., Teng, P., Chew, P., Smith, G., & Gopeland, L. (2021). Food system resilience and COVID-19 – Lessons from the Asian experience. Global Food Security, 28, pp. 1-7.

FAO. (1983). Chapter 2. Food security: concepts and measurement. Consulté le decembre 10, 2021, sur https://www.fao.org/3/y4671e/y4671e06.htm

FAO. (2000). L'insécurité alimentaire: la faim au quotidien et la crainte permanente de la famine. Rome: FAO. Récupéré sur FAO: http://www.fao.org/docrep/x8200f/X8200F01.htm

FAO. (2014). The state of food Insecurity in the World 2014: strengthening the enabling environment for food security and nutrition. Rome: FAO.

FAO. (2020a). OVID-19 and the impact on food security in the Near East and North Africa: How to respond? Cairo: FAO.

FAO. (2020b). FAO-Food Security Indicators. Retrieved septembre 15, 2020, from Food and Agriculture Organization of the United Nations: http://www.fao.org/fileadmin/templates/ess/foodsecurity/Food_Security_Indicators.xlsx

FAO, IFAD, UNICEF, WFP, & WHO. (2022). The State of Food Security and Nutrition in the World 2022. Rome: FAO.

FISCRCR. (2005). Comment évaluer la sécurité alimentaire ?: Guide Pratique pour les Sociétés Nationales africaines. Genève: FISCRCR.

Hami, H. (2022). Algeria's social support policy: Economic costs and the need for reform. Bawader: Arab Reform Initiative.

Han, S., Roy, P. K., Hossain, M. I., Byun, K.-H., Choi, C., & Ha, S.-D. (2021, January 9). COVID-19 pandemic crisis and food safety: Implications and nactivation strategies. Trends in Food Science & Technology, 109, pp. 25-36.

HLPE. (2020). Impacts of COVID-19 on food security and nutrition: developing effective policy responses to address the hunger and malnutrition pandemic. Rome: CFS.

ILO. (2020). The impact of the COVID-19 pandemic on jobs and incomes in G20 economies. Saudi Arabia: ILO-OECD.

IMF. (2022). Inflation rate, average consumer prices: Annual percent change. Retrieved July 24, 2022, from https://www.imf.org/external/datamapper/PCPIPCH@WEO/DZA

Krejcie, R. V., & Morgan, D. W. (1970). Detremining Sample size for research activities. *Educational and Psychological Measurement*, (30), pp. 607-610.

Lappé, F. M., & Collins, J. (1977). Hunger industry .. the myth of scarcity (éd. 4th). Boston : Houghton-Mifflin.

Mardones, F. O., Rich, K. M., Boden, L. A., Morreno-Switt, A. I., Caipo, M. L., Zimin-veselkoff, N., . . . Baltenweck, I. (2020). The covid-19 pademic and global food security. *Frontiers in Veterinary Science*, 7, pp. 1-8.

Monfort, P. F. (2009). La sécurité alimentaire un enjeu politique d'actualité, mouvement pour une organisation mondiale de l'agriculture. Consulté le Decembre 30, 2021, sur momagri: http://www.momagri.org/FR/articles/La-securite-alimentaire-un-enjeu-politique-d-actualite-_471.html

Mouloudj, K., Bouarar, A. C., & Fechit, H. (2020). The Impact of Covid-19 Pandemic on Food Security. Les Cahiers du Cread, 36(03), pp. 159-184.

Naidoo, R., & Fisher, B. (2020, July 9). Sustainable Development Goals: pandemic reset. Nature, 583, pp. 198-201.

NU. (2020). Analyse rapide de l'impact socio-economique du covid-19 sur L'Algerie. Algérie: Le Système des Nations Unies en Algérie.

ONS. (2014). Enquête sur les dépenses de consommation et le niveau de vie des ménages 2011. Algérie: ONS.

ONS. (2015). Enquête sur les dépenses de consommation et le niveau de vie des ménages 2011: Dépenses des ménages en alimentation et boissons en 2011. Algérie: ONS.

ONS. (2019). Résultats de l'enquête annuelle sur les salaires auprès des entreprises. Algérie: ONS.

ONS. (2020). Demographie Algerienne. Alger: ONS.

Picchioni, F., Goulao, L. F., & Roberfroid, D. (2021, August 26). The impact of COVID-19 on diet quality, food security and nutrition in low and middle income countries: A systematic review of the evidence. *Clinical Nutrition*, pp. 1-8.

PNUD. (2009). la sécurité alimentaire dans un pays sahélien. Niger: PNUD.

Rahal , F., & Tahri , K. (2022). The Impact of Covid-19 Pandemic on Algeria: Agriculture Sector and Food SecuritY. Journal of the economic and management researches, 2(2), pp. 239-264.

Rahman, M. T., Akter, S., Rana, M. R., Sabuz, A. A., & Jubayer, M. F. (2022). How COVID-19 pandemic is affecting achieved food security in Bangladesh:A perspective with required policy interventions. Journal of Agriculture and Food Research, pp. 1-5.

Riely, F., & al, e. (1999). Food Security Indicators and Framework for Use in the Monitoring and Evaluation of Food Aid Programs. USA: U.S. Agency for International Development.

Roscoe, J. T. (1975). Fundamental research statistics for the behavioral sciences. New York: Holt, Rinehart and Winston.

Sharma, A., Tiwari, S., Deb, M. K., & Marty, J. L. (2020). Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2): a global pandemic and treatment strategies. *International Journal of Antimicrobial Agents*, 56, pp. 1-13.

Shaw, J. D. (2007). World Food security: a history since 1945 (Vol. 1). New York: PALGRAVE MACMILLAN.

Stringer, R. (2016). Food security Global overview. In M. Caraher, & J. Coveney, Food Poverty and Insecurity: International Food Inequalities (pp. 11-18). Switzerland: Springer International Publishing.

Sutton, K. (1974). Agrarian reform in Algeria: The conversion of projects into action. *Africa Spectrum*, 9(1), pp. 50-68.

Thompson, S. K. (2012). Sampling (Vol. 3rd Ed). New Jersey: A John Wiley & Sons, Inc., Publication.

UN. (1949). Article 25: Item 1. United Nation Universal Declaration of Human Rights. New york: UN.
UN. (2017). Household size and composition around the World 2017. New York: Population Division of the Department of Economic and Social Affairs of the United Nations.
UN. (2020). Policy Brief: The Impact of COVID-19 on Food Security and Nutrition. New York: UN.
USDA. (2020). COVID-19 - Agriculture Situation: Algeria. USA: USDA.
WB. (1986). poverty and Hunger: Issues and options for Food Security in developing Countries. A policy study of World Bank. Washington: The World Bank.
WB. (2022). BRIEF: Food Security Update. Récupéré sur The WORLD BANK: https://www.worldbank.org/en/topic/agriculture/brief/food-security-update
Weingärtner, L. (2005). The Concept of Food and Nutrition Security. Achieving Food and Nutrition Security, Actions to Meet the Global Challenge A Training Course Reader. Germany: Internationale Weiterbildung und Entwicklung gGmbH et al.
WHO. (2022). 14.9 million excess deaths associated with the COVID-19 pandemic in 2020 and 2021. Retrieved from World Health Organization: https://www.who.int/news/item/05-05-2022-14.9-million-excess-deaths-were-associated-with-the-covid-19-pandemic-in-2020-and-2021
WHO. (2022). Algeria Situation. Consulté le July 2022, 26, sur World Health Organization: https://covid19.who.int/region/afro/country/dz
Wyatt, J. C. (2000). When to Use Web-based Surveys. *Jouranl of American Medical informatics Association*, pp. 426-429.

Appendix 1. Questionnaire

No.	**Axis/ Phrases**
1st axis: The availability and stability of food commodity supply during the COVID-19 pandemic	
01	Food commodities did not know a decrease in their availability compared to the period before the outbreak of the Covid-19 pandemic
02	The supply of nationally produced food commodities has not known a retraction during the COVID-19 pandemic period
03	The supply of imported food commodities has not known a retraction in the market during the COVID-19 pandemic period
04	My household has not suffered instability in the supply of food commodities during the period of the COVID-19 pandemic
05	My household did not at all times face the problem of not being able to get all their food needs during the COVID-19 pandemic period
2nd axis: The ability to obtain food commodities axis during the COVID-19 pandemic	
01	The quarantine measures imposed by the state during the COVID-19 pandemic did not make it difficult for my household to move to get food commodities from stores and/or markets
02	My household's economic access to obtain food commodities has not diminished compared to the period before the outbreak of the COVID-19 pandemic
03	My household spending value on the food basket has not increased compared to the period before the outbreak of the COVID-19 pandemic
04	I don't think that the length of the COVID-19 pandemic will weaken my household's economic access to get their food commodities

3rd axis: Quality and safety of food commodities during the COVID-19 pandemic	
01	My household gets all its nutrients (proteins, vitamins, salts...) during the COVID-19 pandemic period
02	My household did not suffer from nutritional deficiency diseases (stunting, wasting, underweight...) during the COVID-19 pandemic period
03	My household's consumption of food commodities of starchy origin (cereals, roots, tubers, potatoes...) did not increase during the COVID-19 pandemic period
04	My household's access to safe water has not been affected compared to the period before the outbreak of the COVID-19 pandemic

Appendix 2. Distribution of the Research Sample Households to the States

State	**f**	**(%)**	**State**	**f**	**(%)**	**State**	**f**	**(%)**
Adrar	4	0.63	Djelfa	24	3.76	El Bayadh	5	0.78
Chlef	12	1.88	Jijel	64	10.03	Illizi	1	0.16
Laghouat	6	0.94	Setif	31	4.86	Bordj Bou Arreridj	6	0.94
Oum EL Bouagui	11	1.72	Saida	5	0.78	Boumerdes	4	0.63
Batna	22	3.45	Skikda	12	1.88	Taref	4	0.63
Bejaia	10	1.57	Sidi Bel Abbess	3	0.47	El oued	9	1.41
Biskra	17	2.66	Annaba	20	3.13	Khenchla	6	0.94
Bechar	2	0.31	Guelma	5	0.78	Souk Ahras	2	0.31
Blida	12	1.88	Constantine	95	14.89	Tipaza	8	1.25
Bouira	16	2.51	Médéa	14	2.19	Mila	17	2.66
Tebessa	9	1.41	Mostaganem	3	0.47	Ain Defla	5	0.78
Tlemcen	15	2.35	Msila	12	1.88	Naama	1	0.16
Tiaret	8	1.25	Mascara	4	0.63	Ain Temouchent	1	0.16
Tizi ouzou	2	0.31	Ourgla	24	3.76	Ghardaia	6	0.94
Alger	86	13.48	Oran	64	10.03	Relizane	5	0.78
Total							**638**	**100**