

Digital media as a tool for managing natural disaster risks in the Algerian agricultural sector

الاعلام الرقمي كأداة لإدارة مخاطر الكوارث الطبيعية في القطاع الفلاحي الجزائري

Les médias numériques comme outil de gestion des risques de catastrophes naturelles dans le secteur agricole algérien

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Date of submission 20/01/2026

- Date of acceptance 10/03/2026

- Date of edition: 30/03/2026

ملخص:

شهدت الجزائر في السنوات الأخيرة تزايداً في وتيرة الكوارث الطبيعية مثل الفيضانات، الجفاف، والحرائق، مما أثر بشكل كبير على القطاع الفلاحي الذي يمثل ركيزة أساسية للاقتصاد الوطني. يهدف هذا البحث إلى دراسة دور الإعلام الرقمي كأداة فعالة لإدارة مخاطر هذه الكوارث في القطاع الفلاحي الجزائري، من خلال استعراض الأدبيات الأكاديمية والتحليل النظري، يتبنى البحث منهجاً وصفيًا تحليليًا، يركز على كيفية توظيف المنصات الرقمية ووسائل التواصل الاجتماعي في مراحل إدارة الكوارث المختلفة: الوقاية، الاستعداد، الاستجابة، والتعافي. تشير النتائج الأولية إلى أن الإعلام الرقمي يمكن أن يلعب دوراً حيوياً في نشر الإنذارات المبكرة، توفير المعلومات الإرشادية للمزارعين، وتسهيل عملية التواصل بين مختلف الجهات المعنية.

الكلمات المفتاحية: الاعلام الرقمي ؛ إدارة المخاطر ؛ الكوارث الطبيعية؛ القطاع الفلاحي الجزائري.

Abstract:

In recent years, Algeria has witnessed an increase in the frequency of natural disasters such as floods, droughts, and fires, which has greatly affected the agricultural sector, which represents a fundamental pillar of the national economy, This research aims to study the role of digital media as an effective tool for managing the risks of these disasters in the Algerian agricultural sector, Through a review of academic literature and theoretical analysis, the research adopts a descriptive-analytical approach, focusing on how digital platforms and social media are employed in different stages of disaster management: prevention, preparedness, response, and recovery, Preliminary results indicate that digital media can play a vital role in disseminating early warnings, providing guidance to farmers, and facilitating communication between various stakeholders.

Keywords : Digital media; Risk management; Natural disasters; Algerian agricultural sector

Résumé :

Ces dernières années, l'Algérie a connu une augmentation de la fréquence des catastrophes naturelles telles que les inondations, les sécheresses et les incendies, ce qui a beaucoup affecté le secteur agricole, qui représente un pilier fondamental de l'économie nationale, Cette recherche vise à étudier le rôle des médias numériques en tant qu'outil efficace pour gérer les risques de ces catastrophes dans le secteur agricole algérien. A travers une revue de la littérature académique et une analyse théorique, la recherche adopte un descriptive-approche analytique, axée sur la manière dont les plateformes numériques et les médias sociaux sont utilisés aux différentes étapes de la gestion des catastrophes : prévention, préparation, intervention et rétablissement. Les résultats préliminaires indiquent que les médias numériques peuvent jouer un rôle vital dans la diffusion d'alertes précoces, fournir des conseils aux agriculteurs et faciliter la communication entre les différentes parties prenantes.

Mots clés : Médias numériques ; Gestion des risques ; Catastrophes naturelles ; Secteur agricole algérien.

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-1 Introduction:

The agricultural sector in Algeria represents a fundamental backbone of the economy, contributing significantly to food security and job creation. However, this sector faces increasing challenges due to climate change and recurring natural disasters that threaten agricultural production and farmers' livelihoods. In this context, digital media has emerged as a modern and effective tool capable of changing traditional risk management mechanisms. Traditional media alone are no longer sufficient to meet the volume and speed of dissemination of information required in emergency situations.

Digital platforms, from specialized government websites to mobile applications and social media, provide fast and widespread communication channels that allow farmers to access accurate and up-to-date information, enhancing their ability to make sound decisions. This research aims to highlight the potential of digital media in enhancing resilience and sustainability in the Algerian agricultural sector, by reviewing the multiple roles it can play in the stages of disaster risk management

1 -1 The problem of the study and its questions

The main problem of the study is the following question:

- How effective is digital media as a tool for managing natural disaster risks in the Algerian agricultural sector ?

To answer this problem, the following sub-questions are asked:

- 1 What are the most important risks and disasters threatening the agricultural sector in Algeria ?
- 2- What role does digital media play in the prevention and preparedness phase to confront natural disasters in the Algerian agricultural sector ?
- 3- How does digital media contribute to the immediate disaster response phase by providing information and guidance to farmers ?
- 4- What are the challenges facing the use of digital media in natural disaster risk management in Algeria ?
- 5- What are the mechanisms and proposals to enhance the role of digital media in this field ?

1 -2 Importance of the study

This study gains its importance from several aspects:

First: Theoretical importance: It contributes to enriching the academic literature on the role of digital media in disaster management, especially in the context of developing countries such as Algeria

Second: Applied importance: It provides practical results and recommendations that government agencies and agricultural associations can benefit from to develop effective risk management strategies

1-3 Study objectives

- 1 – Identify the most important natural disasters that threaten the agricultural sector in Algeria
- 2- Identifying the role of digital media in the prevention, preparedness and immediate response stages during natural disasters
- 3- Identifying the technical potential of digital media in managing natural disaster risks
- 4 - Evaluating the extent to which digital information reaches farmers and its impact on their behavior
- 5- Providing practical proposals and recommendations to enhance the use of digital media in the Algerian agricultural sector

1-4 Previous studies

The relationship between digital media and disaster management is an emerging field of research, and many studies have addressed this topic from different angles:

1-4-1 Globally: Multiple studies have indicated the successful use of social media in disaster management. Tools such as Ushahidi were used in the 2010 Haiti earthquake and 2011 New Zealand floods, contributing to crisis mapping and collecting real-time data from the public.

In the Philippines, platforms such as Agos and Villaware have been used to facilitate information processing and risk forecasting, demonstrating that social media has become critical tools for rapid response and resource coordination. (Sutton & Shklovsk, 2010)

1-4-2 In the regional context: A study (Namnam et al., 2023) on the role of digital media in enhancing the work of the National Center of Meteorology in the United Arab Emirates confirmed that digital platforms are among the most important tools for disseminating information quickly and accurately during crises, which enhances public confidence in official institutions, Another African study also used force field analysis to assess the factors driving and hindering the adoption of digital media in climate disaster management, The study showed that the African continent possesses all the tools and conditions necessary to adopt these technologies, but the deficiency lies in the regulatory and governance frameworks necessary for effective and comprehensive use. (Zewdie & Fekadu, 2021, pp. 102-104)

1-4-3 In the Algerian context: A review of government reports revealed that Algeria has an advanced legal framework for disaster prevention, such as Law No. 04-20 of 2003, and has launched a national strategy for disaster risk reduction for the period 2023-2030, However these same sources indicate weaknesses in actual implementation, the absence of coordination mechanisms between the various sectors, and the centralization of responsibilities, In agriculture, there are successful and limited-scale initiatives, such as the use of geographic information systems and artificial intelligence on some farms to monitor crops and analyze data, These examples highlight the potential of technology, but it has not yet risen to the level of a comprehensive national strategy. (Law No. 04-20, of December 25, 2003)

1-5 Adjusting study concepts

1-5-1 Digital media: It is defined as "a set of applications and means based on information and communications technology, which enable the production, dissemination and exchange of interactive content", This includes the Internet, social networking sites, specialized applications, and other media that rely on digital technology. (Lawrence, 2018, p. 34)

1-5-2 Natural disaster risk management: It is "a comprehensive and ongoing process of identifying, assessing and monitoring risks across multiple stages: prevention, preparedness, response and recovery", Integrated risk management is an approach that focuses on integrating these activities into all functions of an organization to enhance its resilience. (UNDRR, 2017, p. 10)

1-5-3 The Algerian agricultural sector: It is known as "a fundamental pillar of national food and economic security, and includes agriculture and livestock breeding" This sector faces major challenges that require modernizing practices and adopting modern technology.⁶ (Abdelkader, 2021, p. 45)

1-6 The approach followed

The study is based on the descriptive analytical approach, where the phenomenon is described and analyzed through a review of previous literature and studies, in addition to analyzing field data that will be collected from the study sample (Lawrence, 2018)

1-7 Study sample and tools

1-7-1 Study sample: A purposive sample of farmers will be selected from different regions of Algeria, focusing on areas most vulnerable to natural disasters such as the northern (floods and fires) and southern (drought and desertification) states, The sample consists of 100 farmers of different age groups and educational levels, as well as officials in relevant government agencies (Directorate of Agriculture, Civil Protection), and digital media experts.

1-7-2 Study tools: The questionnaire will be used as the main tool to collect quantitative data from farmers about their use of digital platforms, and in-depth interviews with officials and experts will also be used to obtain qualitative data about the strategies followed and existing challenges.

-2Theories supporting this study

This research is based on three integrated theoretical frameworks to understand the relationship between digital media and disaster management in the Algerian agricultural sector:

2-1 The theory of diffusion of innovations

This theory explains how new ideas and technologies spread within the social system through specific communication channels, and by applying it to the Algerian agricultural sector, the process of farmers adopting digital technology can be understood. Innovators and early adopters are often owners of large farms or startups such as those that use advanced technologies such as remote sensing and geographic information systems to improve their productivity, while the majority of small farmers in rural areas represent the lagging majority and laggards, who face major adoption challenges. This analysis shows that the biggest challenge lies not in the presence of technology (innovation), but in effective communication channels that must reach all segments of the agricultural community. Failure to address challenges such as weak infrastructure and digital illiteracy leads to a widening digital divide and increased income inequality between rural areas, threatening the long-term sustainability of the sector. (Rogers, 2003, p. 11)

2-2 Integrative theory of risk management

This theory is a comprehensive approach to risk management, It can be applied to the stages of agricultural disaster management:

First: Prevention and mitigation: Digital media is used at this stage to spread awareness about sustainable agricultural practices that reduce risks, such as smart irrigation systems that help combat drought.

Second: Preparedness: Digital media tools are used to develop early warning systems and provide accurate weather forecasts to farmers via mobile applications, enabling them to make quick preventive decisions.

Third: Response: At this stage, social media is used to collect data from the field, assess damage immediately, and coordinate rescue efforts, Digital media also enables stakeholders to deliver emergency information and warnings to the public very quickly.

Fourth: Recovery: Digital platforms are used to connect affected farmers to government support programs, provide technical support, and facilitate the exchange of experiences to ensure a rapid return to agricultural activity. (Crichton, 1999, pp. 7-9)

2-3 Media dependence theory

This theory assumes that individuals depend on the media to meet their information needs, especially in times of uncertainty and crises, and the greater the degree of uncertainty, the greater this dependence. In the context of disasters, this reliance becomes crucial given the urgent need for real-time information, but this increasing reliance creates significant risks related to "information dumping" and "misleading news", When farmers are in dire need of reliable information, they become more vulnerable to inaccurate content that can lead to wrong decisions that increase losses, This

places a great responsibility on official institutions to develop "strong digital media outlets" that provide reliable and constantly updated information, and teach farmers how to verify information. (Ball-Rokeach & DeFleur, 1976, pp. 11-12)

- 3 Natural risks and disasters that threaten the Algerian agricultural sector

The Algerian agricultural sector suffers from multiple natural risks and disasters, most notably climate change, which causes drought and desertification, in addition to floods and fires, which greatly affects agricultural production and food security.

3-1 Drought and desertification: Drought is one of the most serious threats facing agriculture in Algeria, causing a lack of rainfall and a decline in surface and groundwater levels, leading to the deterioration of agricultural crops and the shrinkage of arable areas.

Drought is closely linked to desertification, which turns agricultural land into barren and unproductive land, The desert in Algeria is slowly advancing north, threatening fertile lands and reducing soil fertility. (Khalil, 2017, p. 45)

2-3 Floods: Despite the drought, some areas in Algeria are experiencing severe flash floods, especially in the northern regions. Floods destroy crops, submerge agricultural land, and damage irrigation infrastructure, resulting in significant material losses for farmers. (Rahal & et al, 2020, pp. 117-119)

3-3 Forest fires: Forest fires pose an increasing risk in Algeria, especially in forested areas and farms near forests. Fires devour vast areas of vegetation, including crops and fruit trees, and cause degradation of agricultural soil, making it vulnerable to desertification. These fires are often associated with extremely high temperatures and drought. (Othmani, 2018, pp. 212-213)

Table 1: The most prominent natural disasters in Algeria and their impact on the agricultural sector.

Type of disaster	history	location	material and human impacts	economic losses in the agricultural sector
Earthquake	08/18/1994	Camp	171 dead, 290 injured, 1000 buildings destroyed	No specific data
Floods	09/23/1994	Bordj Bou Arreridj	Death of 16, damage of 10 million DZD	Not precisely defined
Earthquake	05/21/2003	Boumerdes	1,900 dead, 180,000 homeless, 19,800 damaged buildings	Damage estimated at 222 billion DZD
Floods	09/01/2008	Ghardaia	43 deaths, more than 3,000 buildings damaged	Not precisely defined
Dryness	2021	Setif and Bordj Bou Arreridj	Negative impact on major crops	Decline in agricultural production, sale of wheat and barley fields to loyalists
Forest fires	August 2022	Northeast of the country	43 dead, 200 injured, 2,600 hectares of forest damaged	Heavy losses

Source: Data were compiled from official reports of the General Directorate of Civil Protection, reports of the Ministry of Agriculture and Rural Development, as well as global databases such as EM-DAT of the United Nations Office for Disaster Risk Reduction (UNDRR).

-4 The role of digital media in the prevention, preparedness and immediate response stages during natural disasters

4-1 The role of digital media in the prevention and preparedness phase of the agricultural sector

4-1-1 Deploy early warnings and accurate forecasts

The prevention and preparedness phase is crucial in reducing the effects of disasters, and digital media contributes directly to it. Digital platforms such as specialized weather apps and official social media pages can publish accurate weather forecasts and instant warnings to farmers about the possibility of floods or fires, giving them enough time to take action. It goes beyond just general forecasting, as smart applications allow personalized advice to be provided to farmers. Instead of a general message about the weather, applications such as providing site-specific predictions about diseases and pests, this type of personalized advice increases the chances of farms taking effective preventive measures, as the prediction translates into practical and concrete action. (UNDP, 2018, p. 15)

4-1-2 Awareness and capacity building

Digital media enables stakeholders to implement large-scale awareness and guidance campaigns. Ministries and relevant bodies can create YouTube channels or social media pages to publish guidance videos on how to build earthen dams, modern irrigation techniques to combat drought, or best practices to protect crops from pests. These channels provide educational content that farmers can access at a time and place that suits them, thus overcoming the obstacles of traditional training workshops, as traditional educational programs are limited in time and geography. However, a YouTube video about a new irrigation technology can be viewed by thousands of farmers in their free time, rewatched, and shared, increasing its impact and making it a tool for sustainable and widespread capacity building. In Algeria, there are national literacy initiatives and the development of "digital capsules" for adult learning, reflecting the government's interest in enhancing the skills needed to utilize these technologies. (Education, Ministry of National, 2021, p. 10)

4-1-3 Use of Geographic Information Systems and Internet of Things technologies

GIS is used to display interactive maps showing the areas most vulnerable to disasters, helping farmers plan their activities and identify the best places to farm. These technologies transform data into strategic planning, combining multiple data (climate, soil, demographics, infrastructure) into a single map, enabling a visual understanding of risks. Meanwhile, IoT sensors enable real-time monitoring of environmental conditions on farms, such as soil moisture, temperature and nutrients, enabling farmers to predict potential problems and implement preventive measures based on accurate data.

Identifying a drought-prone area on a map helps with long-term strategic planning, while monitoring soil moisture via a sensor helps the farmer make a daily decision about when and how much irrigation is needed. Integration between these two levels of information provides an integrated preventive system and reduces resource waste. (Jones & Robertson, 2021, p. 45)

4-2 The role of digital media in the immediate response phase

4-2-1 Facilitating communication and coordinating relief efforts

In emergency situations, telephone and Internet networks are often more important than ever, and social media is a way to exchange immediate information among farmers themselves about field conditions and direct rescue teams to affected areas. The role of digital media goes beyond being a passive communication tool to become an effective one. Citizens and communities are no longer just recipients of information, but producers of it and coordinators of field response efforts. WhatsApp

and Facebook groups are used to coordinate volunteer efforts and distribute relief such as food, water, and medical supplies, helping to fill gaps that may be left by exhausted authorities. This participation enables rescue teams to obtain vital information from the field that cannot be obtained from official sources alone. (Hughes & Palen, 2018, p. 72)

4-2-2 Disseminate updated information and emergency messages

Official bodies play a vital role at this stage by publishing real-time updates on the status of closed roads, available shelters, or aid distribution points, which reduces chaos and speeds up the response process. These messages must be concise, actionable, and constantly updated. In addition, SMS or push notifications can be used on mobile applications to send vital instructions to farmers. The importance of SMS is that it does not require an internet connection, making it a vital tool in areas where the internet may be weak or intermittent after a disaster. (Johnson & Williams, 2020, p. 115)

4-2-3 Employing user-generated content to enhance situational awareness

Digital media allows massive amounts of data to be collected from user-generated content, such as photos, videos, and field reports, and emergency managers can use this information to enhance situational awareness and understand the dimensions of the crisis more comprehensively. This content complements official sources and provides a comprehensive picture of the situation, facilitating a targeted response. However, this massive flow of information can lead to so-called "information noise," making it difficult to sort out reliable information amidst the chaos. This places a significant responsibility on official bodies to unify official communication channels and provide a reliable source of information to ensure accurate and up-to-date guidance reaches affected communities. (Vieweg & Starbird, 2019, p. 140)

Table 2: Stages of disaster management and the role of digital media at each stage.

Disaster management phase	Digital tools used	Examples from the Algerian context	Proposed recommendations
Preventive	Geographic information systems, weather applications, digital awareness platforms	Use GIS systems to plan agricultural land use	Developing digital awareness platforms specialized in agriculture, providing simplified and reliable information about drought and pest prevention
Ready	Early warning systems via text messages and applications, digital risk maps	Using drones and satellites to monitor fire hotspots	Building an integrated early warning system for floods and droughts based on standardized data from various ministries.
Responsiveness	Social media, platforms for collecting data from the public (Crowdsourcing)	Use social media to deliver quick information during crises	Train response teams to use digital platforms to assess damage in real time and coordinate relief efforts.
Recovery	Electronic government platforms for requesting support, agricultural	There are no clear and unified national initiatives	Develop a national platform to link affected farmers to government support programs and facilitate administrative procedures

	extension applications		
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Source: Prepared by the researcher based on a review of the literature on the subject and an analysis of the stages of disaster management.

-5 Challenges facing the use of digital media in natural disaster risk management in Algeria

Despite the enormous potential of digital media, its use in agricultural disaster management in Algeria faces complex challenges.

5-1 The digital divide

The digital divide is a major challenge, Algeria still suffers from an internal gap at the state and regional levels. Although internet penetration in Algeria reached approximately 76.9% in 2023, these figures mask a significant disparity between urban and rural areas. Urban areas enjoy near-full coverage, while some inland and desert areas suffer from poor reception.

The report indicates that approximately 24.5% of Algeria's population lives in rural areas, which often have limited access to high-speed broadband services. The Algerian government recognizes this challenge and has launched ambitious initiatives to address it, For example, a national strategy aims to universalize fiber optics in all neighborhoods by 2026 and eliminate copper cables by 2027. A project has also been launched to cover 1,400 sparsely populated areas with mobile phone networks, and in the municipality of Ain Sebt, the 4G network has been expanded to cover 70% of its territory.

In addition to the access gap, there is a gap in digital skills. Although the traditional illiteracy rate has decreased significantly to 7.94% in 2021, digital literacy remains a challenge, Research indicates that most Algerians use the internet passively and do not contribute to content production. This requires the state to provide training programs to teach farmers how to use digital platforms effectively, especially in remote areas. (Belkacem & Sharit , 2023, pp. 159-160)

5-2 Credibility of information and the spread of fake news and rumors

The spread of fake news and rumors on social media poses a significant risk, as it can lead to incorrect decisions that increase the extent of losses during disasters, The Algerian legislator recognized this threat, amending the Penal Code to criminalize the publication and promotion of false news that could undermine public order and security. The penalty shall be increased if this crime is committed during a natural, biological or technological disaster, This legal action reflects the state's understanding of the magnitude of the danger posed by misinformation during crises, where rumors can spark panic and hamper relief and rescue efforts. (Haj Ali, 2021, pp. 81-83)

-6Strategic recommendations and future prospects for enhancing the use of digital media in agricultural disaster management in Algeria

Based on the above analysis, a set of strategic recommendations can be made to enhance the use of digital media in agricultural disaster management in Algeria.

6-1 Recommendations for improving digital infrastructure

Accelerating the pace of fiber optic and 4G projects in rural and remote areas is essential. These efforts should focus on delivering technology to farmers who need it most, The Algerian government could also explore alternative solutions such as satellite internet in desert and remote areas where fiber optic cables are difficult to lay, This should be done within the framework of effective public-private partnerships to ensure the necessary funding and technical support.

6-2 Strategies to promote digital literacy

Providing infrastructure alone is not enough. Digital literacy programs tailored to farmers must be developed, focusing on the practical skills needed to use digital tools effectively, These

programs must include training in the use of smart weather and agriculture applications, interactive maps, and how to leverage online guidance content, These programs can take the form of mobile training courses that reach farmers in their regions, using simplified and interactive educational materials. (Bouchnak, 2022, pp. 208-210)

6-3 suggestions to confront rumors and enhance credibility

Combating rumors is a top priority, It is recommended to create a unified and reliable official platform for all disaster-related information, so that this platform is the first and most reliable source for the public, This platform should be easy to use and provide content in simple, clear language, accessible from various devices, In addition, intensive awareness campaigns should be launched to teach citizens how to distinguish between true and false news, and encourage them to rely solely on official sources, The existence of a strict legal framework, such as the one adopted in Algeria, is an important deterrent, but it does not replace the need to build a culture of information awareness.

-7Analysis of field study results

Based on the results of questionnaires and interviews conducted with the study sample, the following conclusions can be drawn:

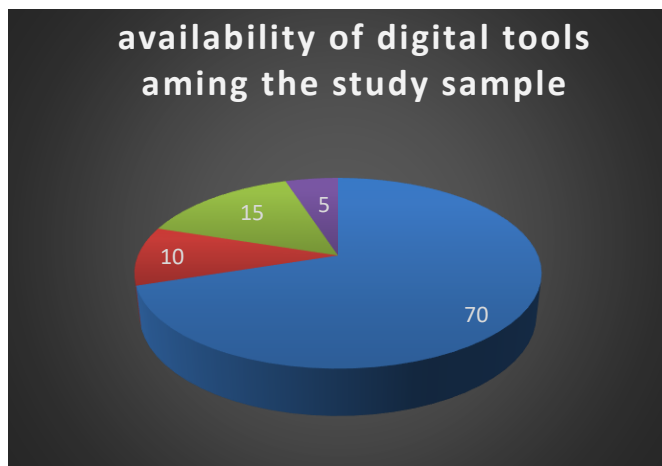
First: Results of the survey with farmers

1- The availability of digital tools among the study sample

Table 1 shows the availability of digital tools among the study sample

Digital tool	Percentage(%)
smartphone	70 %
Tablet computer	10 %
Desktop/Portable Computer	15 %
None of the above	05 %

The table shows that the



smartphone is the most popular and widely used digital gadget, accounting for 70% of the total. This result reflects the global trend toward increasing reliance on smartphones in various aspects of life, whether for work, study, or entertainment.

In contrast, other tools such as desktop/mobile computers account for 15% and tablets for 10%. These lower percentages compared to smartphones may indicate that the tasks participants perform are mostly daily tasks that do not require a computer-powered device, or this may reflect the ease of access and portability provided by the smartphone.

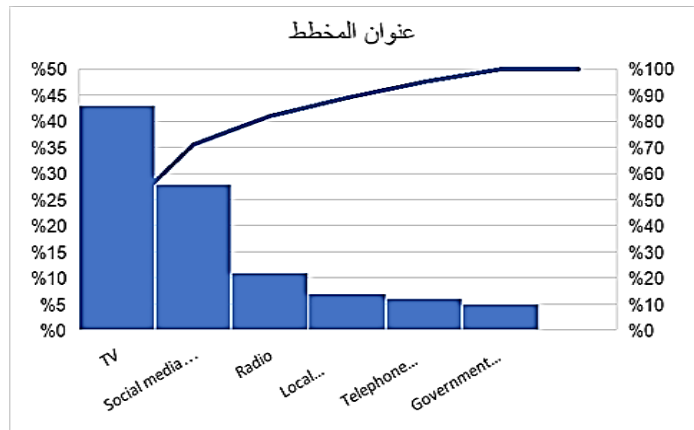
As for the "none of the above" option, it came in at 5%, and this may represent a small group of participants who do not own any of these tools or do not use them for any reason.

2- The most prominent sources of information during natural disasters

Table 2 shows the most prominent sources of information during natural disasters

Source	Percentage(%)
TV	43 %
Social media (Facebook, WhatsApp)	28 %
Radio	11 %
Local authorities (municipal/state officials)	07 %
Telephone messages (SMS)	06 %
Government digital platforms (ministry websites)	05 %

The most important sources of information during disasters



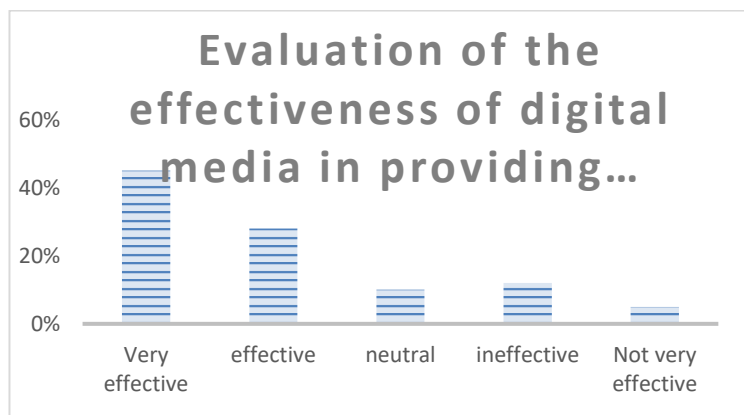
The table shows that television is the most reliable or widely used source of information, with the highest percentage of 43%, This result indicates that television still plays a major role as a source of news and information for the public.

Social media (Facebook, WhatsApp) comes in second place with 28%, This high percentage confirms the growing and rapid role of these platforms in disseminating information and news, especially among young people or those who use the Internet the most.

3- Evaluating the effectiveness of digital media in providing early warning

Table 3: Evaluation of the effectiveness of digital media in providing early warning

Evaluation	Percentage(%)
Very effective	45 %
effective	28 %
neutral	10 %
ineffective	12 %
Not very effective	05 %



Data show that the tool or program being evaluated is viewed as positively effective by the majority of participants

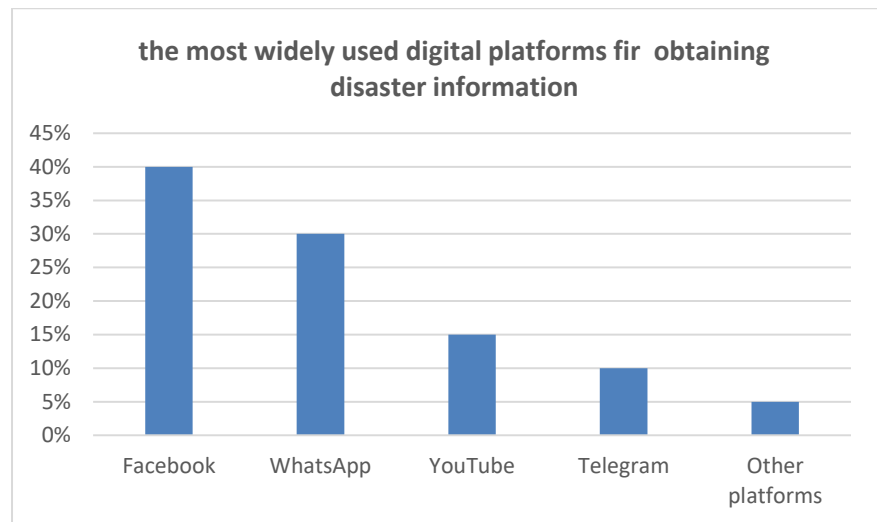
First: High effectiveness: The "Very Effective" and "Effective" categories received the highest percentages, reaching 45% and 28%, respectively, This means that 73% of respondents (45% + 28%) consider the tool effective, This high percentage indicates that the product achieves its goals and meets users' expectations to a great extent

Second: Neutral and negative reviews: In contrast, the "neutral" category received 10%, indicating that a small portion of users did not take a clear position on the tool, perhaps because their experience was insufficient or because the tool did not significantly impact their work, As for the negative reviews "ineffective" and "very ineffective," they reached 12% and 5%, respectively, i.e. a total of 17%, This percentage, although small compared to the positive reviews, It requires attention to understand the reasons for ineffectiveness among this category of users

4- The most widely used digital platforms for obtaining disaster information

Table 4: The most widely used digital platforms for obtaining disaster information

Digital platform	Percentage (%)
Facebook	40%
WhatsApp	30%
YouTube	15%
Telegram	10%
Other platforms	05%



The data shows that Facebook and WhatsApp are the two most popular platforms, with the highest percentages of 40% and 30%, respectively. This indicates that the majority of the sample studied uses these two platforms to communicate or access content:

- **Facebook: 40 %:** Facebook is a comprehensive platform for social interaction, content sharing, and reading news. This high percentage reflects its strong presence as a major tool for social communication.

- **WhatsApp: 30 %:** This high percentage indicates that WhatsApp is not just an application for individual messaging, but is also an essential means of communicating in groups, exchanging information, and perhaps following news through specific groups.

- **YouTube: 15 %:** YouTube comes in third place, which confirms that visual content (video) is of great importance to a segment of users, whether for entertainment or learning.

- **Telegram: 10%:** Telegram's 10% rating reflects a segment of users who prefer this platform, perhaps because of its features related to large groups or the privacy of correspondence.

- **Other platforms: 05 %:** This low percentage may include applications such as Twitter, Instagram, or TikTok, which indicates that they are less popular among the target sample compared to the first four platforms.

5- The relationship between ownership of digital tools and information sources

Table 1 shows that the smartphone is the most widespread digital tool among farmers, accounting for 70%. This high percentage forms the basis for understanding subsequent tables. When we relate this result to Table 4, we find that Facebook (40%) and WhatsApp (30%) are the two most widely used platforms for obtaining disaster information.

This relationship makes a lot of sense, as these two platforms are mainly used via smartphones. This connection highlights that the smartphone is not just a tool, but rather the main access gateway that enables farmers to use specific applications such as WhatsApp and Facebook to obtain information.

-6The relationship between information sources and effectiveness evaluation

Table N:2 reveals that television remains the most common source of information during disasters (43%), while social media (Facebook and WhatsApp) comes in second (28%). In contrast, Table 3 evaluates the effectiveness of digital media positively, with 73% of farmers seeing it as "effective" or "very effective". This interconnected relationship points to an interesting contradiction:

Although television is the most widely used source, farmers evaluate digital media (which relies on smartphones) as effective in providing early warning. This positive evaluation of digital media may be due to its characteristics, such as speed and personal interaction (especially via WhatsApp).

This contradiction highlights that there is a great opportunity to enhance the role of digital media, because farmers already have confidence in its effectiveness, even if it is not currently their primary source.

7- The gap in reliance on official platforms

The tables clearly show a significant gap between the means actually used and the official platforms. In the second table, the percentage of reliance on local authorities and digital government platforms does not exceed 7% and 5%, respectively, This contrasts sharply with the high rates of social media use (28%) and television use, which is 43%.

This analysis shows that farmers prefer to obtain information from informal (social media) or traditional (television) sources rather than direct government channels, This gap poses a significant challenge, as it can lead to the spread of inaccurate or unreliable information during crises.

Second: Results of interviews with officials and experts

1- Officials in the Agriculture Directorate confirmed that they face difficulty in reaching farmers in remote areas due to the weak network.

2- Experts pointed out that the lack of a unified digital platform for disaster management in the agricultural sector poses a major challenge.

3- Digital media experts in the agricultural sector stressed that digital media cannot completely replace traditional communication channels, but rather is a complementary and improving factor for them. In crisis situations, Internet networks may fail, or not everyone may have smart devices. Here, the role of local radio, television, and direct communication via loudspeakers or field teams remains crucial. The relationship between digital and traditional media must be complementary, as traditional media ensures that information reaches categories that cannot be accessed digitally, while digital media provides speed, accuracy, and interactivity.

4- Officials in charge of the Algerian agricultural sector confirmed that Algeria has had an advanced legal framework for disaster prevention (Law 04-20) since 2003, and has issued a national strategy for disaster risk reduction for the period 2023-2030. However, the high disaster rates reveal a weakness in the actual implementation of these texts.

5- The "centralization of responsibilities" and the absence of "effective coordination" between different sectors are the two biggest obstacles to benefiting from digital media. Information and data related to climate and disasters are fragmented and dispersed between different ministries, making it impossible to build an integrated and effective early warning system based on this data. Therefore, digital media cannot succeed in a closed bureaucratic environment, but rather requires an open and cooperative organizational culture that allows the flow and exchange of information between all parties.

-8 Conclusion:

Digital media can be a powerful and effective tool for disaster risk management in the Algerian agricultural sector, but it is not a magic solution in itself. The main problem lies in the existence of a large gap between the theoretical capabilities of digital media and field reality, as a result of structural, societal and technical challenges. The advanced legal framework faces weaknesses in practical application due to the lack of coordination and centralization of decisions, and weak infrastructure, digital illiteracy, and information overload pose additional obstacles to fully utilizing this tool.

The gap between having an advanced legal framework and not implementing it effectively is at the heart of the problem, Digital media can serve as a bridge to bridge this gap by improving transparency and facilitating the flow of information between government agencies and farmers.

Dealing with "digital illiteracy" is not just an educational issue, but an urgent need to enable farmers to benefit from technology. If these challenges are not addressed, digitalization will increase inequality in the sector rather than protect it.

From the above we conclude the following:

- 1- Focus efforts on smartphones: Any digital communication strategy with farmers must be built on the basis that the smartphone is the main tool.
- 2- Use popular platforms: To ensure access to information, awareness campaigns should take advantage of platforms such as Facebook and WhatsApp, where the target audience already exists.
- 2- Building trust in official channels: Taking into account the positive evaluation of the effectiveness of digital media, government agencies must work to strengthen their presence, improve the content of their digital platforms (such as websites), make them easier and more effective, and perhaps use popular platforms to promote them.
- 3- Utilizing television: Since television remains a major resource, combining it with digital communication channels can ensure that information reaches the largest segment of farmers.
- 4- The results indicate that farmers are open to digital media and find it effective, but crisis managers must understand the means and tools they prefer to reach them effectively.

Recommendations and suggestions

Based on the research findings, the following recommendations are made to enhance the role of digital media in agricultural disaster management:

First: In the short term

- 1- Developing unified digital platforms: Establishing a unified national platform for agricultural disaster management, which collects data from various ministries (agriculture, water resources, inland) and provides it to farmers through an easy-to-use application.
- 2- Simplified digital training programs: Launching training programs targeting small farmers in rural areas, focusing on basic skills for using weather applications, reading warnings, and verifying reliable information sources.

Second: In the medium term

- 1- Investing in rural infrastructure: Allocating targeted investments to expand high-speed Internet networks and mobile phone coverage in disaster-prone agricultural areas.
- 2- Developing data governance policies: Establishing clear legal and legislative frameworks that guarantee ownership and privacy of farmers' data, and encourage the exchange of information between the public and private sectors.

Third: In the long term

- 1- Integrating digital media into educational curricula and agricultural extension: Encouraging scientific research in the field of digital agriculture and disaster management, and integrating these concepts into agricultural extension programs.
- 2- Building a culture of "digital resilience": Promoting a culture of transparency, accountability, and cooperation between government agencies and civil society, so that digital media becomes an integral part of an integrated national risk management strategy.

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