JOURNAL OF ADVANCED ZOOLOGY
ISSN: 0253-7214
Volume ***44*** *Issue* ***S-2 Year 2023*** *Page* ***3202:3214***

The socioeconomic aspect of desertification in the Southern region of the Wilaya of M'sila, Algéria

Madani Djamila[1], Tarai Nacer[2], Abdou Yamina[3], Benchikh Adel[4], Djedilat Lakhdar[5],Tir Chafia[1]

[1]University of M'Sila, Department of Agricultural Sciences, Faculty of Sciences BP 166 Echbilia, 28000, M'Sila (Algeria), djamila.madani@univ-msila.dz, https://orcid.org/my-orcid?orcid=0000-0002-8957-2464.
[2]University of Biskra 07000 (Algeria), Department of Agronomy, Faculty of Exact Sciences.
[3]Associate Professor of Architecture and Urban Planning, Department of Architecture, Biskra 07000 (Algeria), Laboratory of Design and Modelling of Architectural and Urban Forms and Ambiances -LACOMOFA-, University MOHAMED KHIDER, Biskra (Algeria), y.abdou@univ-biskra.dz
[4]NATIONAL SCHOOL OF HYDRAULICS, BLIDA (ALGERIA).
[5]LABORATORY: VALORIZATION OF NATURAL BIOLOGICAL RESOURCES LABORATORY (VRBN) ADRESS: CAMPUS EL BEZ, ALGIERS ROAD, SETIF 19137 (ALGERIA), UNIVERSITÉ SÉTIF 1.

Article History
Received: 29 July 2023
Revised: 28 October 2023
Accepted: 06 November 2023

Abstract

The degradation of the socioeconomic factors is one f the effects of desertification. It manifests in the destruction of the production bases, the decline of the social system, and the decrease of the population. Like the other Algerian Steppic Wilayas, Msila faces an alarming desertification that leads to the degradation of the natural resources and the modification of the land use. The South of Msila (the study region is part of it) became a land for the vegetal production relying on the deep groundwater. However, the unsuitable development methods changed the region and contributed to the desertification and the secondary salination issues. In this context, due to the lack of the researches in this field, it is necessary to evaluate the socioeconomic aspects of the desertification effects. The analysis includes measuring the effects of degradation on the life conditions. To do so, a deep documentary research was conducted on the study region based on the literature review. The study includes a series of surveys on 259 informants in 04 sites. Findings show a bad situation due to the decrease of the agricultural outcomes.

Key words: Algeria, South of M'sila, desertification, aspect, socioeconomic.

INTRODUCTION

The phenomenon of desertification of the steps is expanding and affects the development of the marginalized and poor regions (Nedjraoui & Bedrani, 2008). The study region, known as R'mel (sand region), is one of the pastoral regions that has known important changes since decades regarding the use of the soil resources (Sebhi, 1987; Hadjab, 2010). The rapid evolution of the land use and the different pressures exercised on the environment (natural and anthropologic) oblige us to evaluate the evolution of the region. Thus, we shall analyze the degradation manifestations due the desertification of the study region. The analysis includes measuring the effects of degradation on the life of the informants. This research is mainly based on the observation and a field survey.

Materials and methods:

Study region:

The study region is located in the plain of Southern Hodna, at latitudes 35°3 N and 35°27 N and longitudes 4°12 E and 4°53' E (Figure 1) with a surface of 2880 Km^2; i.e., 15.84% of the territory of Msila. The region is populated by 55629 people (Annuaire statistique de la Wilaya de Msila, 2021) and includes 04 municipalities, as follows:

- The municipality of Khoubana in the North, with a surface of 364 Km^2.
- The municipality of Mcif in the East, with a surface of 381 Km^2.
- The municipality of El Houamed in the South, with a surface of 1745 Km^2.
- The municipality of Maarif in the West, with a surface of 390 Km^2.

Fig. 1. The location of the study region

The study and analysis of the different natural components of our study region (agricultural, pedological, climatic, etc) show that the region is characterized with different soil classes, namely: the raw mineral soils, the calci-magnesic soils, the bit evolved soils, the halomorph soils, and the iso-humic soils(Beloum, 1976; Dekkiche, 1974; Boyadgiev, 1975; Pouget, 1980; Daoud & Halitim, 1994; Abdesselam, 2013). According to Emberger climagram, our region is arid and is characterized with a hydric deficit during the whole year. The vegetation in the study region is Steppic and dominated by thee Alfa *(Stipa tenacissima)*, the spart *(Lygeumspartum)*, white Artemisia *(Artemisia herba alba)*, psammophile species *(Tamarix africana, Thymelaea microphylla, Retama retam)*, and gypsophyte species *(Frankeniathymifolia, Herniariafontanesii)* (Le Houerou *et al*, 1975, Kaabeche, 1996). The study shows that the region has a natural and socioeconomic potential that manifests in the hydric resources and an agricultural variety based on the animalistic and vegetal productions.

On the other hand, it faces various environmental issues such as the drought, the low water quality, the soil, etc due to the human and physical factors. Out of the study surface (288000 acres), we noticed that between 1985 and 2020, the land occupation witnessed an increase in the sanded lands, which reached 8461 acres. The rate of the affected region increased from 1.21% in 1985 to 2.93% in 2020. According to Hadjab (1998), the dynamics of the sand show an extension of the sanding that may be interpreted by the wind action. The eolian formations are centered in the south of Msila where the human contributes with an efficient way through destroying the vivacious spaces (overgrazing) (Mimuone, 1995). In his study on the region of Gourara in the South of Algeria, Mestoul (201) noticed that the sanding might be due to anthropologic factors.

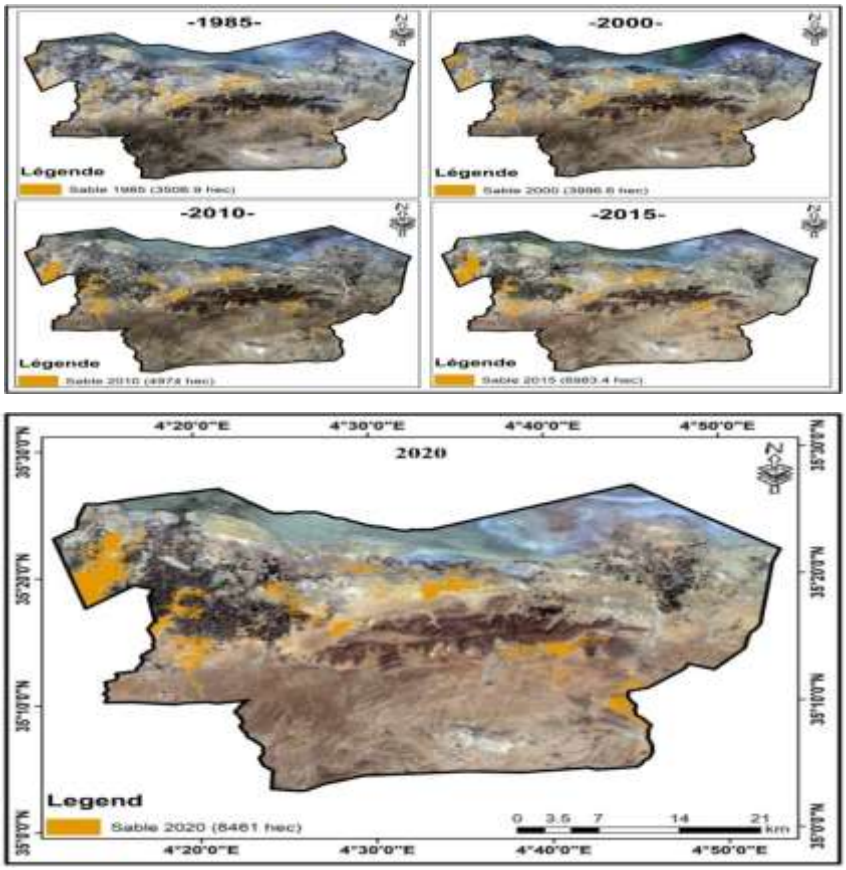

Fig. 2. The map of the region sanding (1985-2020)

Methodology:

The questionnaire is made up of 12 pages and different rubrics. Some difficult questions were deleted. The collected data were put in Excel 5 and analyzed with SPSS 26. Besides, we conducted Chi-square test to check the quality. The informants were chosen based on the agricultural activity whose yields undergo changes due to desertification. We conducted the study from April to June 2021 because the chances of meeting the farmers are high. The study was conducted on 04 sites as follows:

Table 1. sample of the study

Municipality	Site	Population	Sample	%
Maarif	Oueld Sdira	954	75	28.95
Khoubana	Al Qaboudjia	805	61	23.55
M'Cif	Bir larbi	850	59	26.64
El Houamed	Maayza	588	64	20.84
Total		3197	259	100

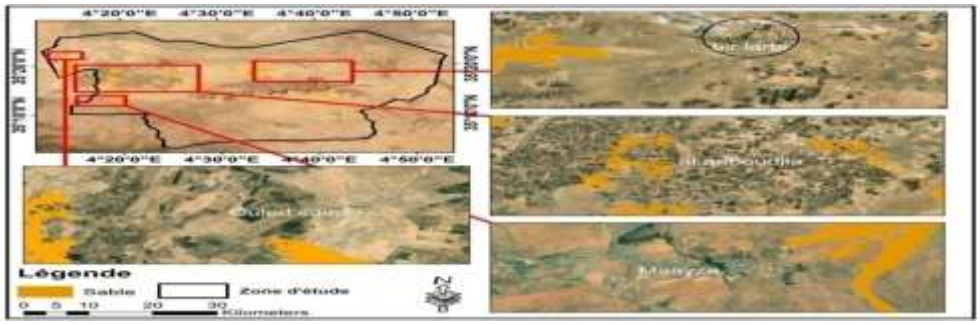

Fig. 3. The map of the municipalities and the study sites.

Results and discussion:

The socio-demographic analysis focused on the size of the families, the average age of the informants, and the educational level. (Floret & Pontanier, 1982 ; Khatteli, 1996; Cornet, 2002 ; Sghaier *et al.* 2003 ; Bord & Fetoui, 2008 ; Fetoui *& al.* 2009 ; Picouet *et al.* 2013) considered that these criteria are among the most important factors that directly or indirectly affect the degradation of the landscapes and the desertification. According to Mardy et al. (2020), the identification of the age classes of the informants in the scientific research is important because the sensitivity to the problems differs from age to another. In this regard, the ages of the informants are between 25 and 78, with an average of 51 years old. 64.9% are +50; of which 32% are +70 years old (figure 04). This tells us that the region faces the issue of the aging agricultural labor force

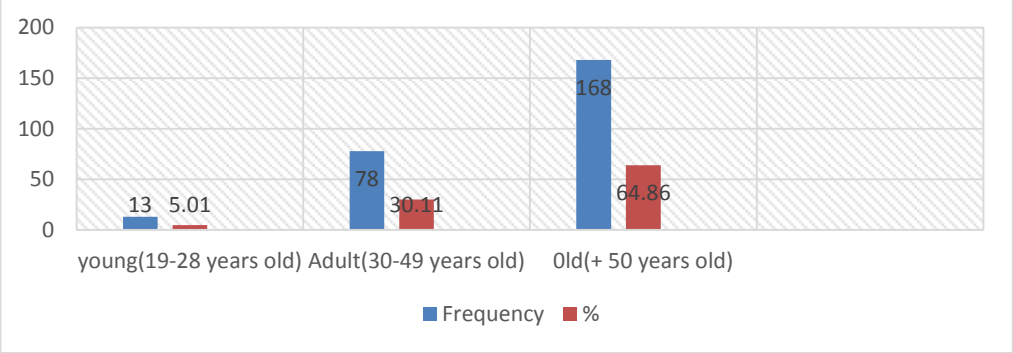

Fig. 4. The distribution of the ages of the informants.

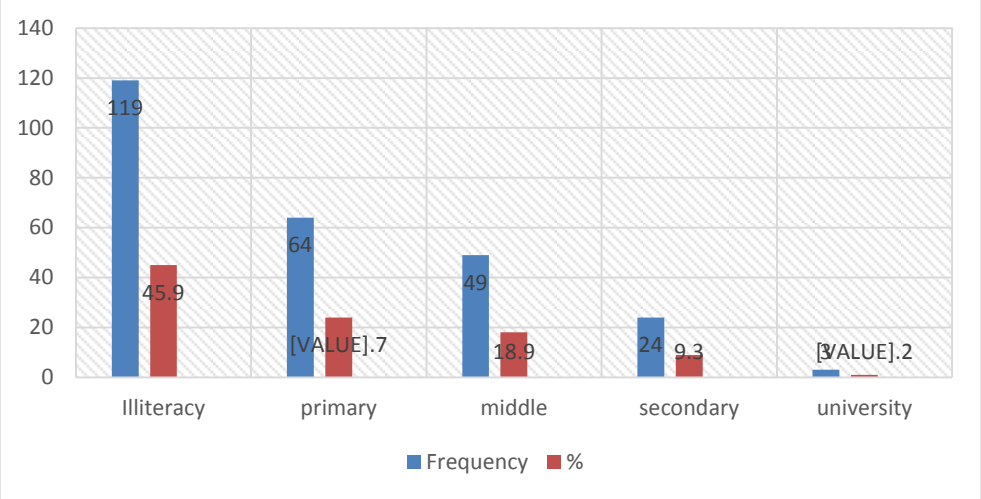

Fig. 5. The distribution of the informants according to the educational level

As for the educational level, 45.9% are illiterate, 24.7% did not pass the primary education, 18.19% have a middle education level, and 1.2% have a university level. The level of illiteracy is high and may lead to a limited vision of the dangers of desertification.

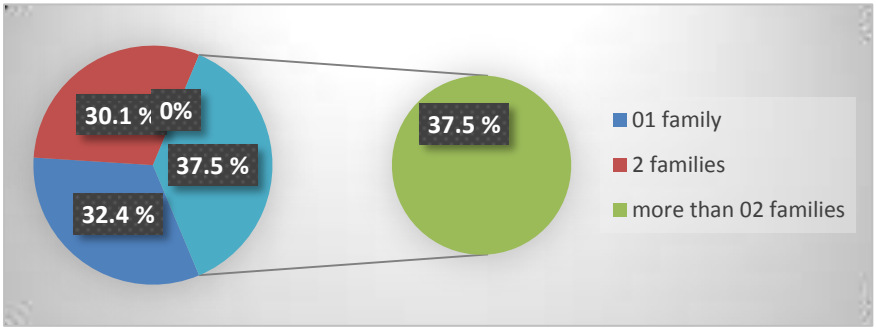

Fig. 6. Distribution of the informants according to the number of families

Figure 06 shows that 37.5% of the informants provide for 03 families, 32.4% for 01 family, and 30.1% for 02 families. The average size of the families is 6.39 people. On the other hand, figure 07 shows that 65% of the informants are married and have schoolchildren, while the non-schooled children represent a rate of 35% due to the lack of transportation. This weak rate increases with time.

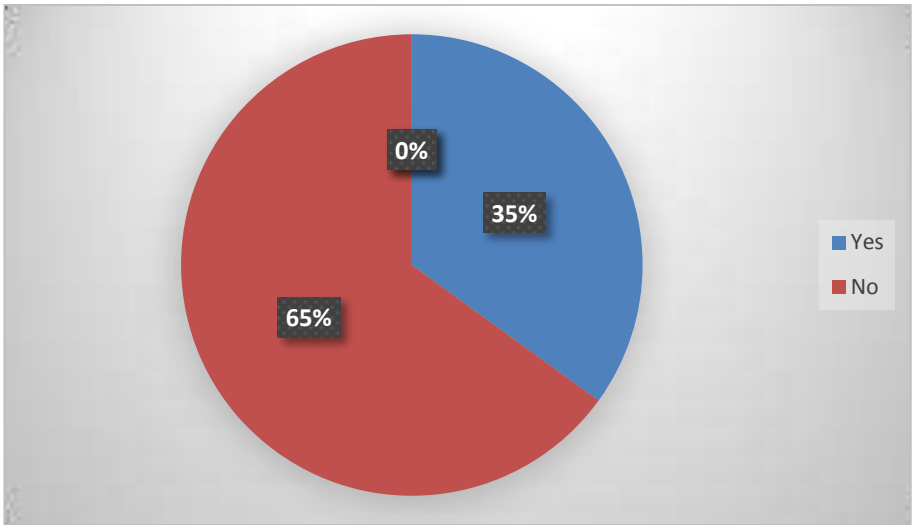

Fig. 7. The informants' schooled children

The rate of schooled children is an index of stability and gives an idea about the level of education of the population of the study zone and their ability to understand and monitor the risks of the inappropriate use of the resources and the importance of the participation to the anti-desertification measures.

Table 02 shows whether the informants can detect desertification on their agricultural lands.

Table 2.The detection of desertification by the informants

	Frequency	**Percentage**	**Theoretical N**	**Residuals**	**DF**	**Chi-square**	**Sig.**
Yes	257	99,2	-127,5	-127,5	1	251,062[a]	0,000
No	2	0,8	-127,5	-127,5			
Total	259	100,0	///////				

The number of the informants who can detect or feel the presence of desertification is very important. In our case, 99.2% confirm they can detect the desertification because it is an old natural catastrophe that is easy to distinguish, as it does not require special tools to detect (Auclair, 2001). After knowing that the majority of the informants know what desertification is, we shall examine their understanding of the desertification and suggest many concepts to see how they perceive it. Results are shown in this figure.

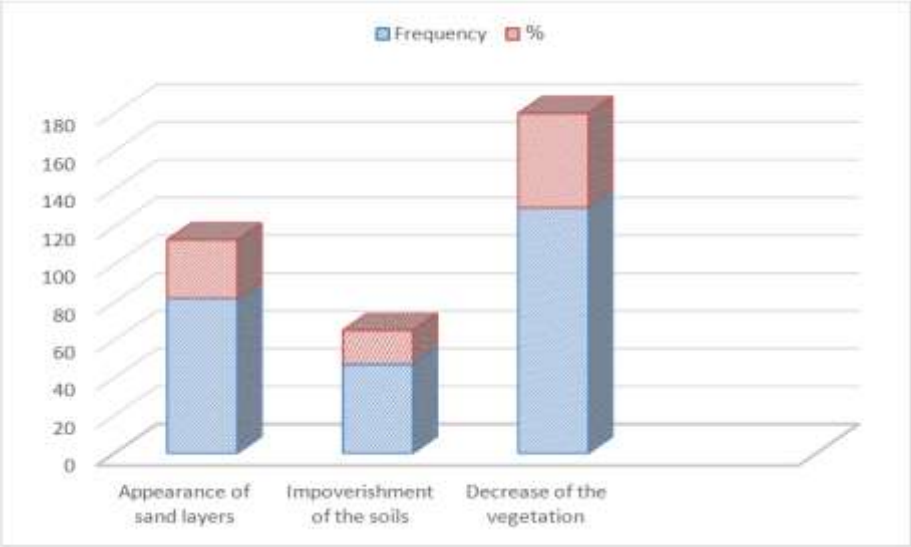

Fig. 8. The indices of recognizing the effects of desertification by the informants

Figure 08 shows the distribution of the informants according to the understanding of desertification. 50.2% believe that the phenomenon is identified through the progressive decrease of the vegetation, 31.7% mentioned the appearance of sand layers, while 18.1% mentioned the soil impoverishment.

Figure 09 shows that the majority feel the effects of desertification on the agricultural lands since almost 20 years ago. The answers show a collective awareness about the spread of the phenomenon since 20 years. According to Bield-Charreton (2007), the effects of desertification appear at a long term. The following figure explains better:

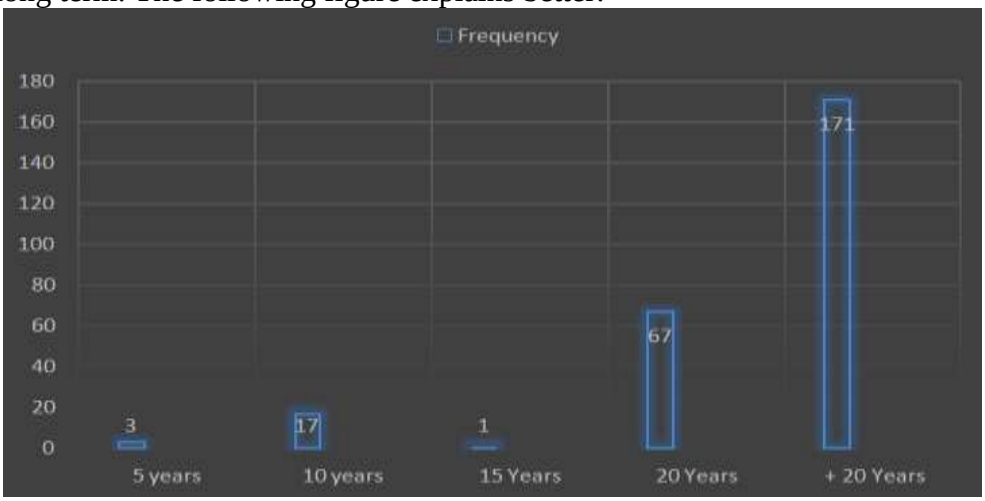

Fig. 9. The perception of desertification by the informants

In order to know whether the desertification has negative effects on the agricultural production, we raised this question, "did desertification create negative effects on the land productivity?" the answers were as follows:

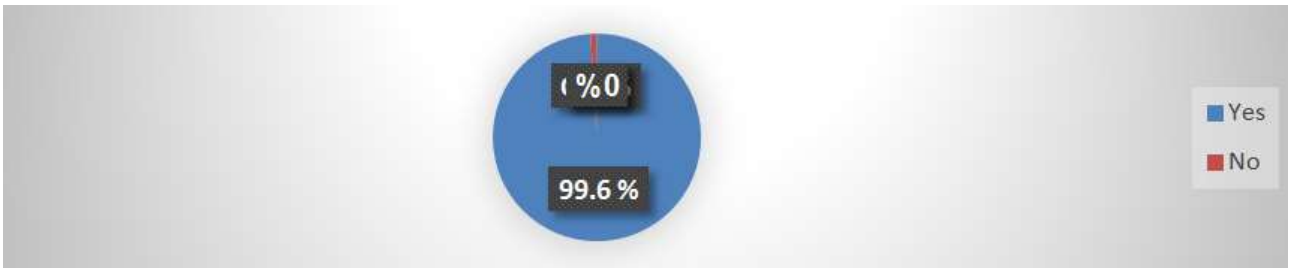

Fig. 10. The impact of desertification on the land productivity according to the informants

Figure 10 shows that 99.6% said that the desertification has negative consequences on the land productivity. Thus, we asked them to justify their answers. The results are shown in this figure:

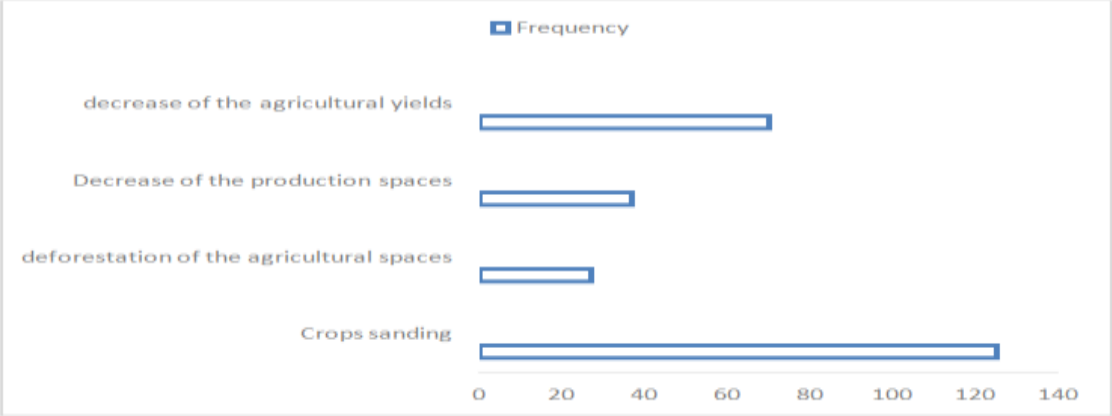

Fig. 11. The negative impacts of desertification on the land productivity according to the informants

The figure shows that most of the informants noticed the negative impacts of desertification on the productivity of their lands. 27% see that these impacts include the decrease of the yield, 14.3% mentioned the decrease of the production species, 10.4% mentioned the desertification of the new agricultural spaces, and 48.3% mentioned the sanding. The sand covers the soils and raises major obstacles regarding the valorization of the farmers work (Hadeid, 2008; Hadeid et al., 2015). Therefore, the farmers have set fences and wind shields. The costs are high for them.

Table 3.The effect of desertification on the population according to the informants

Effects	Frequency	Percentage	theoretical N	Residuals	DF	Chi-square	Sig.
Decrease of the agricultural yield	129	49,8	86,3	42,7	2	41,846[a]	0,000
Increasing rural exodus	44	17,0	86,3	-42,3			
Degradation of the life conditions	86	33,2	86,3	-0,3			
Total	259	100,0	//////////////				

Table 03 shows that among the effects, we find the decrease of the agricultural yield, the rural exodus, and the degradation of the life conditions due to the maladaptation of the affected population. In this regard, the rural exodus increases since a long time because the inhabitants have no other choice than abandoning their lands and moving to new lands or the big cities. Furthermore, desertification has effects on the socioeconomic infrastructures because the global system of the wind actions was not considered when establishing them (Ozer, 2006).

Table 4.The evaluation of the rural exodus by the informants

	Frequency	Percentage	theoretical N	Residuals	DF	Chi-square	Sig.
Important departure by family	40	15,4	86,3	-46,3	2	248,579[a]	0,000
Little departure	205	79,2	86,3	118,7			
Low departure	14	5,4	86,3	-72,3			
Total	259	100,0	//////////////				

Table 04 shows the rate of the rural exodus and that the number of the individuals who moved to the cities is low because the individuals who live in these regions have lands as sources of their incomes. In all cases, we must understand that the exodus is a phenomenon that touches various regions due to the bad conditions in the rural regions in Algeria. The populations are animated by the pursuit of a better life. Nevertheless, the exodus leas to the loss of the active population that works in agriculture to face poverty (Benz & Jouve, 2002).

Figure 12 shows that the majority of the informants see that desertification creates valorization conflicts, as shown in this figure.

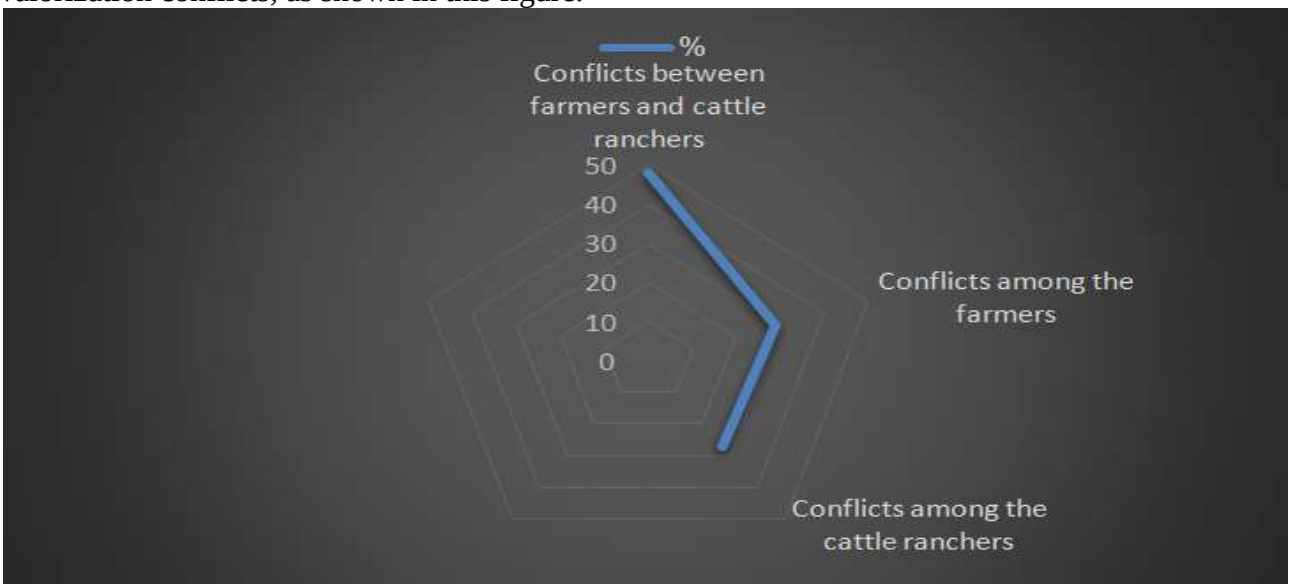

Fig. 12. The potential conflicts according to the informants

48.3% of the informants see that the conflicts for the farmers come from the rarity of the resources and limits the cattle ranching. This rate is significant and calls for urgent movement to face the issue of degradation and decrease of the vegetation (Hadeid, 2008; El Koudrim, 2013). Then, we asked, "what are the most important economic activities affected by decertification?" The informants mentioned agriculture in the top, in addition to the crafts, the commerce, and the cattle ranching; as shown in this figure:

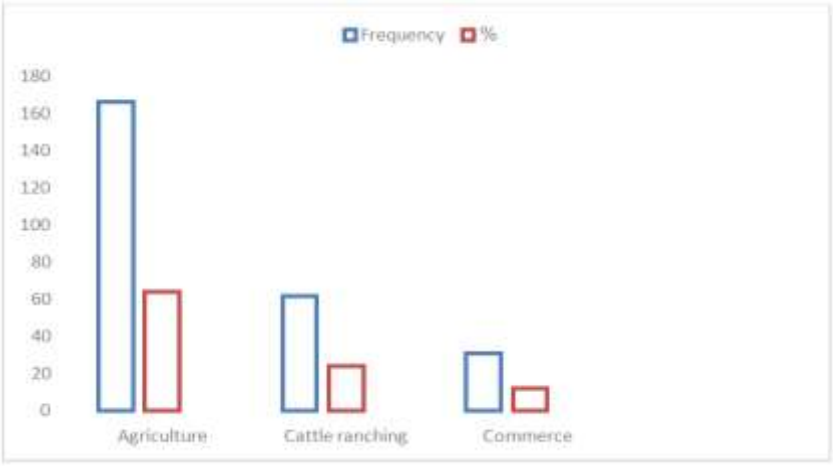

Fig. 13. The most important economic activities affected by decertification

Then, we wanted to know the products affected by desertification and raised the question that said, "What are the most important goods whose prices had been affected by desertification?". The answers included the cereals in the top with a rate of 64.68, in addition to the meat, the vegetables, etc; as shown below:

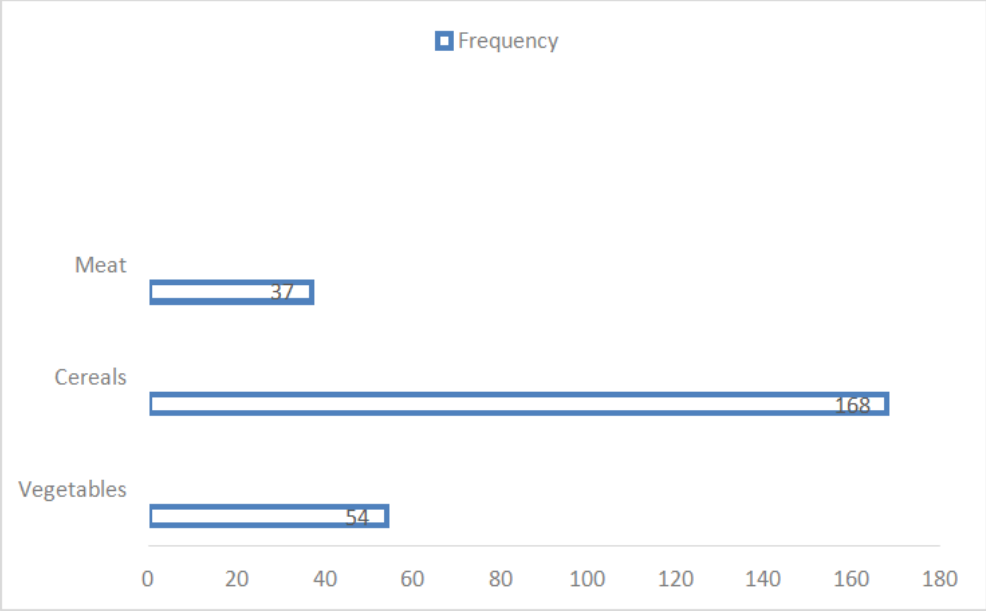

Fig. 14. The impact of desertification on the consumption goods

Then, we raised this question, "do you use plants for heating and cooking?" to know whether they destroy the vegetation. Results showed that 32% of the informants use the plants due to the lack of the natural gaz.

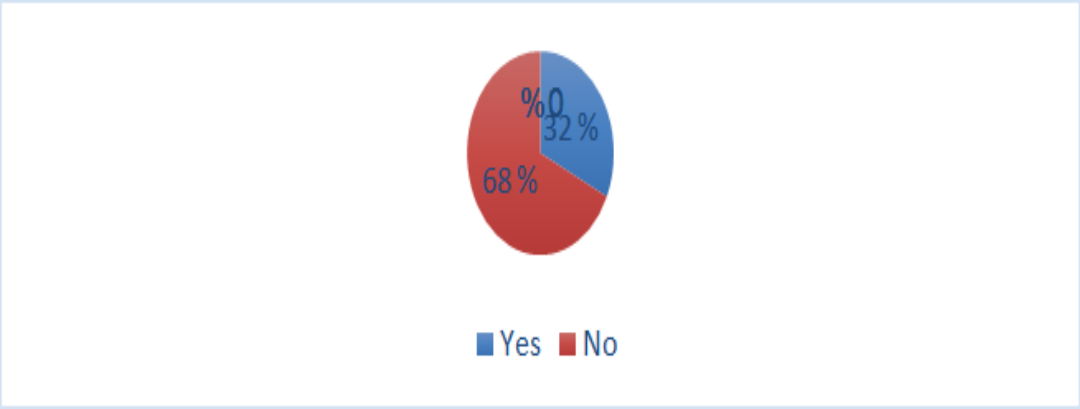

Fig. 15. The use of the plants by the informants for heating and cooking

Table 5.The causes of using the plants by the informants for heating and cooking

	Frequency	**Percentage**
Lack of natural gas	39	15,1
Weak revenues	00	00
Easy access	00	00
Lacking system	218	84,2
Total	259	100,0

Rognon (1995) and Chaker (1997) point that the anthropic actions accelerate the process of desertification. We shall show the importance of the public participation in the strategies of executing, monitoring, and evaluating the anti-land degradation measures in the following figure:

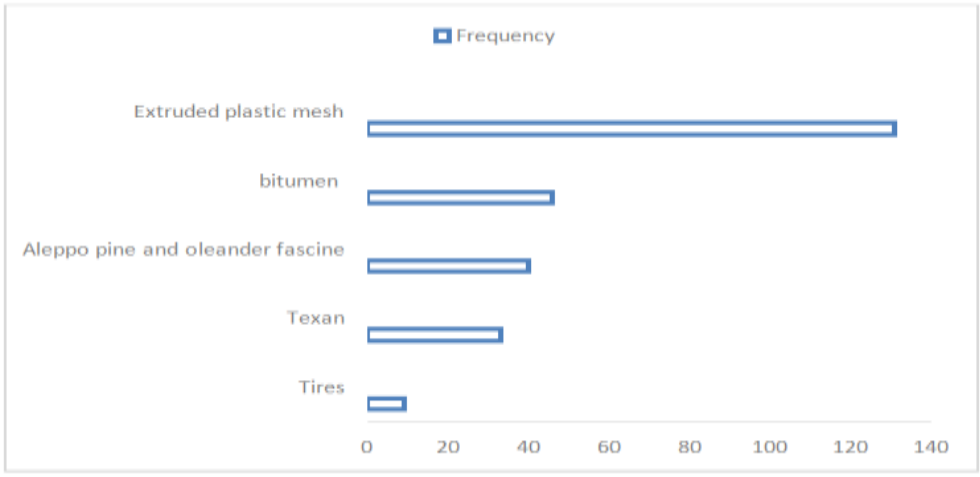

Fig. 16. The mechanical means of fighting the desertification by the informants

The figure shows that 50.6% of the informants use the extruded plastic mesh or dry palms as a mechanic tool against desertification. Besides, the vegetal materials were subject to various experiments and showed probing results. Nevertheless, due to their small surfaces, they were abandoned.

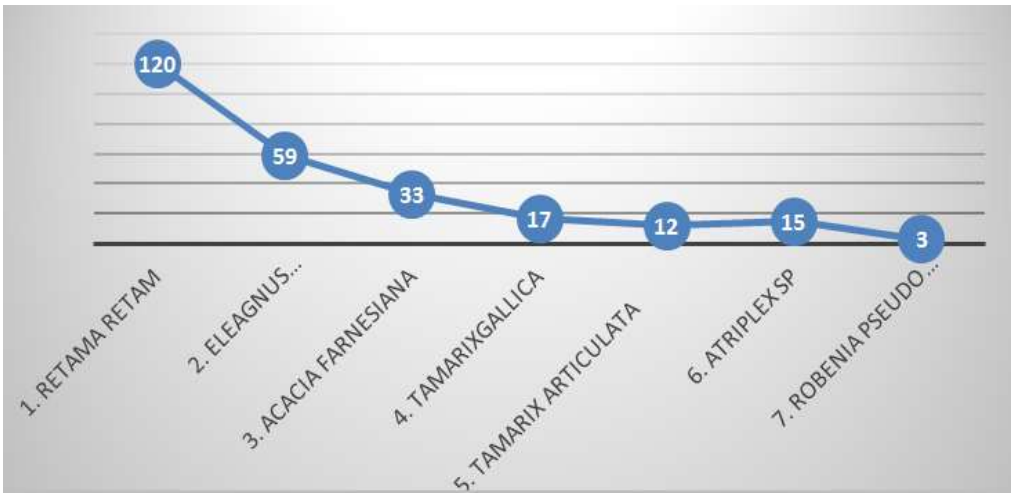

Fig. 17. The biological means of fighting desertification by the informants

The figure shows that 46.33 of the informants use *Retama Retam* as a biological means against desertification. Due to their poverty and the land degradation dynamics, they cooperate with governmental services. In this regard, Bazzani (2009) points that the fight against land degradation may be very efficiency if the popular participation is effective and widened in all the possible aspects. This includes the material aspects, the change of the behaviors in the lands, the acceptance and mastery of the new techniques, etc.

Table 6.The governmental intervention against desertification according to the informants

	Frequency	**Percentage**	**theoretical N**	**Residuals**	**DF**	**Chi-square**	**Sig.**
Yes	186	71,8	128,5	57,5	1	51,459[a]	0,000
Non	71	27,4	128,5	-57,5			
Total	257	99,2	///////				
Lacking system	2	0,8					
Total	259	100,0					

According to 71.8% of the informants, the state intervenes against desertification. 63.42% of them say that the state uses the Microproject while 36.57% say that it uses fighting program (table 06). The majority, 76.4%, say that there is no non-governmental intervention against desertification,

23.6% say that there is a non-governmental intervention, while 18.9 say that the intervention manifests in vulgarization days (table 07).

Table 7.The means of non-governmental intervention in the region according to the informants

	Frequency	**Percentage**
Activities that generate revenues	00	00
Counter-season agricultural activities	00	00
Training the population to fight land desertification	17	6,6
Technical reliance on the local communities	00	00
Financial support	00	00
Vulgarization days	49	18,9
Choice of species	00	00
Awareness raising on the pastoral load	7	2,7
Total	73	28,2
Lacking system	186	71,8
Total	259	100,0

According to the informants, the intervention is not satisfying.

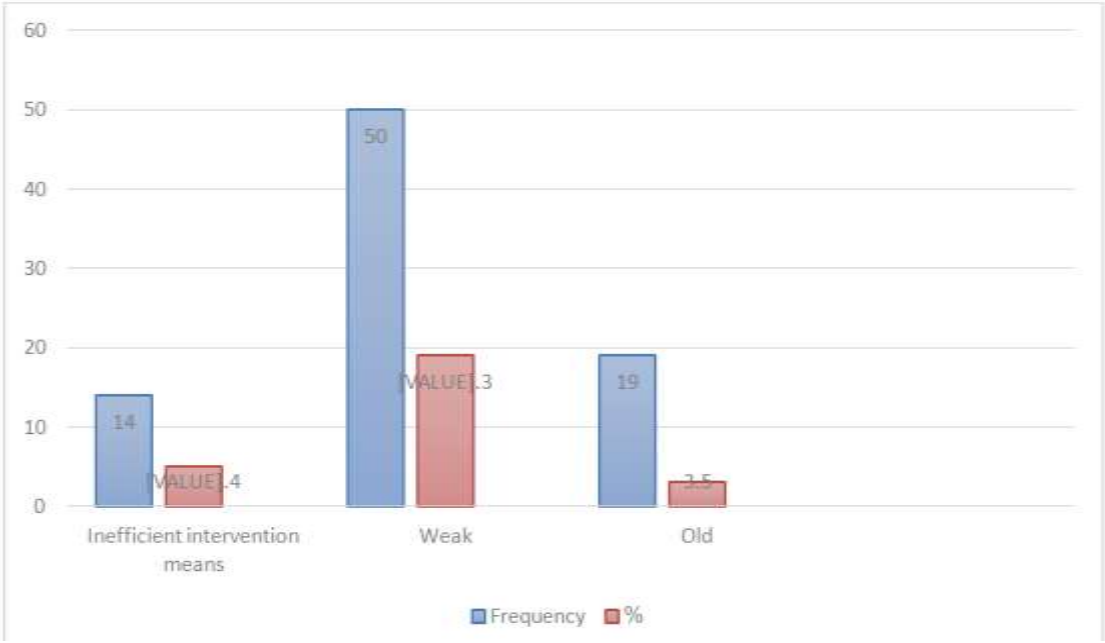

Fig. 18. The appreciation of the efficiency of the intervention means by the informants

Discussion:

The findings of our study show that:

- The informants do not sufficiently engage in the fight against desertification.
- The socioeconomic restrictions manifest, according to El Zerey et al. (2009), in the depopulation and devitalization of the rural spaces, the extension of the unemployment, the poverty, the food insecurity, and the predominance of the agricultural revenues.

Boukhobza (1982), Khldoum (2004) & Nedjraoui (2009) point that the sanding in the agglomerations and the communication paths increase the vulnerability of the local population. The degradation of the life conditions leads to abandoning the traditional houses by the farmers and the agro-farmers, and to moving towards the cities and the neighboring agglomerations for a better life. The findings agree with those of Auclair (2001), Haddouche et al (2008), and Mestoul (2021) who see that the appearance of desertification conditions leads to lands desertification.

Conclusion:

The findings about the socioeconomic aspects related to the effects of the decrease of the agricultural yields on the life of the informants show a bad situation. The agricultural revenues decrease due to the very high life costs. However, there are efforts to make up for the situation and alleviate the consequences of desertification. This includes the agricultural development and cattle

ranching projects, and restrictions aiming at preserving the vegetation and decreasing the land degradation and desertification. The pertinence of the suggested solutions depends on the attitudes of the concerned parts (forest conservation department, HCDS, etc) and the involvement of the farmers and cattle ranchers to implement the techniques and take responsibility. The security of the financial resources is irreversible to achieve the participative development aims. In conclusion, the desertification is felt by the population of the region due to the decrease of the vegetation, the sand dunes, the land impoverishment, the decrease of the agricultural yields, and the deforestation.

REFERENCES

1. Abdesselam, S. (2013). *Impact de la mise en culture en irrigué sur les sols et les eaux dans un bassin endoreique en zone aride* (Doctoral dissertation, UB1).
2. Annuaire statistique de la wilaya de. (2021).Edition Avril ; 138 p.
3. Auclair, L. (2001). Population et désertification en Tunisie au cours du XXe siècle. *Laurent Auclair, Patrick Gubry, Michel Picouet et Frédéric Sandron (edit.), Régulations démographiques et environnement. Paris: IRD/CEPED/LPE*.
4. Bazzani, F. (2009). La lutte contre la désertification pour le développement durable des terres arides. *Journal of Agriculture and Environment for International Development (JAEID)*, *103*(3), 225-252.
5. Belouam, N. (1976). Caractéristiques macromorphologiques et micromorphologiques de quelques sols à accumulation calcaire du Hodna.
6. Bentz, B., & Jouve, P. (2002). Définitions et caractéristiques générales de la désertification. *Lutte contre la désertification dans les projets de développement, P. Jouve, C. Corbier-Barthaux et A. Cornet. eds.(Paris: AFD)*, 13-21.
7. Bied-Charreton, M. (2007). Etat du monde, désertification. BOIS & FORETS DES TROPIQUES, 293, 3-6
8. Bord, J. P., & Fetoui, M. (2008). Les milieux arides entre vulnérabilité et risque de désertification. In *Colloque GéoTunis 2008, 26 novembre 2008*.
9. Boukhobza, M. (1982). [Economic, social and demographic dynamics of agricultural underdevelopment in Algeria; proposals for amendment].[Case study 1].[French].
10. Boyadgiev, T. G. (1975). Les sols du Hodna (Algérie). *PUNDFAO Rapport technique*, (5).
11. Chaker, M. (1997). Processus de dégradation des terres et désertification dans les pays d'El Aioun-Tanecherfi, Maroc oriental. *Méditerranée*, *86*(1), 5-14.
12. Cornet, A. (2002). La désertification à la croisée de l'environnement et du développement: un problème qui nous concerne. *Sommet du Développement Durable, Johannesburg, 2002*, 93-130.
13. Daoud, Y., & Halitim, A. (1994). Irrigation et salinisation au Sahara algérien. *Science et changements planétaires/Sécheresse*, *5*(3), 151-160.
14. Dekkiche, B. (1974). *Contribution à l'étude des sols du Hodna et corrélations géochimiques des eaux de la nappe* (Doctoral dissertation, Thèse de doctorat Gent. Belgique 211p).
15. Djeddaoui, F., Chadli, M., & Gloaguen, R. (2017).Desertification susceptibility mapping using logistic regression analysis in the Djelfa area, Algeria. *Remote Sensing*, *9*(10), 1031.
16. El Koudrim, M. (2013). Impact des facteurs anthropiques et des stratégies socio-foncières sur l'amplification de la désertification au niveau des Hauts Plateaux de l'Oriental. *Al Awamia*, *127*, 73-89.
17. El Zerey, W., Bachir Bouiadjra, S. E., Benslimane, M., & Mederbal, K. (2009).L'écosystème steppique face à la désertification: cas de la région d'El Bayadh, Algérie. *[VertigO] La revue électronique en sciences de l'environnement*, *9*(2).
18. Fetoui , M., Sghaier, M., Loireau , M.,(2009) . Des indicateurs synthétiques et spatialisés pour l'évaluation des risques de désertification dans les zones arides tunisiennes : cas de l'Observatoire de Menzel Habib », *Actes de colloque international "Sociétés en transition et développement local en zones difficiles, DELZOD"*, Institut des Régions Arides (IRA), Médenine (Djerba, 22-24 avril 2009)
19. Floret, C., & Pontanier, R. (1982). L'aridité en Tunisie présaharienne: climat, sol, végétation et aménagement.
20. Haddouche, I., Toutain, B., Saidi, S., & Mederbal, K. (2008). Comment concilier développement des populations steppiques et lutte contre la désertification?: cas de la wilaya de Nâama (Algérie).
21. Hadeid, M., Bendjelid, A., Fontaine, J., & Ormaux, S. (2015). Dynamique spatiale d'un espace à caractère steppique: le cas des Hautes Plaines sud-oranaises (Algérie). *Cahiers de géographie du Québec*, *59*(168), 469-496.
22. Hadeid, M. (2008). Approche anthropique du phénomène de désertification dans un espace steppique: le cas des hautes plaines occidentales algériennes. *VertigO-la revue électronique en sciences de l'environnement*, *8*(1).
23. Hadjab, M. (1998). *Aménagement et protection des milieux naturels dans la cuvette du Hona (Algérie)* (Doctoral dissertation, Aix-Marseille 1).

24. Kaabeche, M. (1996). Les relations climat-végétation dans le bassin du Hodna (Algérie). *Acta botanica gallica*, *143*(1), 85-94.
25. Khatteli, H. (1996). *Erosion éolienne en Tunisie aride et désertique: Analyse des processus et recherches des moyens de lutte* (Doctoral dissertation, Ghent University).
26. Khaldoun, A. (2004). Les mutations récentes de la région steppique d'El Aricha. *Réseau Parcours*, *59*(54).
27. Le Houérou, H. N., Claudin, J., Haywood, M., & Donadieu, J. (1975).Etudes des ressources naturelles et expérimentation et démonstration agricoles dans la région du Hodna, Algérie. Etude phytoécologique du Hodna. V. 1:(Texte). V. 2:(Plans).
28. Mardy, Z., Weissenberger, S., & Waaub, J. P. (2020). Analyse des pratiques agricoles dans le bassin versant de la rivière Mulet (Roche-à-Bateau, Haïti) et de leur impact sur la dégradation du milieu et les conditions de vie des communautés. *Études caribéennes*, (45-46).
29. Mestoul, D. (2021). Dynamique d'ensablement dans le Gourara au sud de l'Algérie: origines, facteurs d'aggravation anthropiques et perspectives. *Géomorphologie: relief, processus, environnement*, *27*(1), 53-67.
30. Mimoune, S. (1995). *Gestion des sols salés et désertification dans une cuvette enddoreique d'Algérie (sud du Chott Hodna)* (Doctoral dissertation, Aix-Marseille 1).
31. Nedjraoui, D. (2009).La recherche scientifique, un moyen de lutte contre la désertification. *International Policy Imperative*, 231.
32. Nedjraoui, D., & Bédrani, S. (2008). La désertification dans les steppes algériennes: causes, impacts et actions de lutte. *VertigO*, *8*(1), 15.
33. Ozer, P. (2006). Conséquences de la désertification. *Dimension 3*, *2006*(1).
34. Picouet, M. (2013). *Environnement et sociétés rurales en mutation: Approches alternatives*. IRD Editions.
35. Pouget, M. (1980). *Les relations sol-végétation dans les steppes sud-algéroises* (Vol. 116). Paris,, France: Orstom.
36. Rognon, P. (1995). La désertification. *DésertiJication et aménagement au Maghreb*, 9-20
37. Sebhi, S. (1987). *Mutations du monde rural algérien: le Hodna*. Office des publications universitaires.
38. Sghaier, M., Picouet, M., Gammoudi, T., Fetoui, M., & Issaoui, M. (2003). Structures démographiques, activités socio-économiques des ménages et évolutions foncières dans la Jeffara tunisienne, Programme Jeffara. *Rapport scientifique final du thème*, *3*, 56-78.