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**Authors: Bachir Khezzani, El Amine Khechekhouche & Aida Bousbia Brahim**

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# Community Awareness of Agricultural Heritage Systems (GHIAS) Sites: The Case of the Ghout System in the Souf Oasis

**Bachir Khezzani***
University of El Oued
El Oued, Algeria
bachirkhezzani05@gmail.com

**El Amine Khechekhouche**
University of El Oued
El Oued, Algeria
elamine73@yahoo.fr

**Aida Bousbia Brahim**
University of El Oued
El Oued, Algeria
bousbia.aida@gmail.com

***Corresponding author**

## Abstract

The Ghout is a traditional agricultural system located principally in the Souf Oasis (Algerian Sahara); it has been classified by the Food and Agriculture Organization of the United Nations (FAO) as a globally important agricultural heritage system (GIAHS) since 2005. The main objective of this investigation study is to check whether the community of local farmers is aware that their date palm groves (called "Ghouts") have become part of the GIAHS. A questionnaire was designed, and a survey was carried out between 2018 and 2020 for the local farmers who own the Ghout system. The results show that out of 397 participants, only 49 (12.3%) of local farmers know that their Ghout system has become a part of GIAHS. The high educational level and low age have positively impacted acquiring this information. Furthermore, 65.3% of local farmers gained information about GIAHS classification mainly through social media and 18.4% by radio and television media. The local farmer community is the significant basis for the conservation and development of the GIAHS, so no conservation process can succeed without them. However, the first step of the conservation policy is for local farmers to know that their Ghouts have become a part of GIAHS. This responsibility lies with the local authorities.

**Keywords**: Farmers; GIAHS; classification, conservation; Souf Oasis; Ghout; Algeria

# Sites de sensibilisation communautaire aux systèmes du patrimoine agricole (GHIAS): Le cas du système Ghout dans l'oasis du Souf

## Résumé

Le Ghout est un système agricole traditionnel situé principalement dans l'Oasis du Souf (Sahara algérien) ; il a été classé par l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) comme un système du patrimoine agricole d'importance mondiale (GIAHS) depuis 2005. L'objectif principal de cette étude d'investigation est de vérifier si la communauté des agriculteurs locaux est consciente que leurs palmeraies de dattiers (appelées "Ghouts") font désormais partie du GIAHS. Un questionnaire a été conçu et une enquête a été réalisée entre 2018 et 2020 auprès des agriculteurs locaux propriétaires du système Ghout. Les résultats montrent que sur 397 participants, seuls 49 (12,3%) des agriculteurs locaux savent que leur système Ghout fait désormais partie du GIAHS. Le haut niveau d'éducation et le bas âge ont eu un impact positif sur l'acquisition de ces informations. En outre, 65,3 % des agriculteurs locaux ont obtenu des informations sur la classification GIAHS principalement par le biais des médias sociaux et 18,4 % par la radio et la télévision. La communauté paysanne locale est la base importante de la conservation et du développement du GIAHS, de sorte qu'aucun processus de conservation ne peut réussir sans elle. Cependant, la première étape de la politique de conservation est que les agriculteurs locaux sachent que leurs Ghouts font désormais partie du GIAHS. Cette responsabilité incombe aux autorités locales.

**Mots-clés** : Agriculteurs ; SIPAM ; classement, conservation; Oasis du Souf; Ghout ; Algérie

## 1.0 Introduction

Historical studies show that the lives of the earliest human societies depended on hunting and grazing activities (Koohafkan & Altieri, 2016). This lifestyle requires a continuous migration of game hunting and monitoring of places of grass growth. However, societies became more settled when they started practicing farming near water sources like rivers, valleys, lakes, and the coast (Khezzani, 2018). In arid regions, this sedentary lifestyle was limited to groundwater locations. These human societies have created several agricultural systems based on limited resources and accumulated knowledge in the local population. Moreover, traditional farming systems are spread in different parts of the world and are characterized by their originality and sustainability (FAO, 2022).

Because of the historical, social, economic, and environmental importance of these agricultural systems (Januel, 2010; Khezzani & Bouchemal, 2018b), the Food and Agriculture Organization of the United Nations (FAO) started the dynamic conservation and sustainable management of the Important Global Agricultural Heritage Systems (GIAHS) in 2002 (Zhang et al., 2018). The conservation initially focused on cases in developing countries (Kajihara et al., 2018). However, the designation process expanded globally at the end of 2005 (Mi et al., 2014). According to the FAO, 58 sites in 21 countries are designated GIAHS (Yotsumoto & Vafadari, 2020), and six other sites have been proposed for classification. Algeria is one country that has an example of this heritage. It

is called the Ghout system and is located in the Souf oasis (Khezzani & Bouchemal, 2018a).

The Ghout system is one of the most attractive attention-getting landscapes that can be seen on a large scale in the Souf oasis (see Figure 1). It is a traditional agricultural system that enabled the first nomadic communities to settle in this harsh environment and successfully practice agriculture (Cauvet, 1934; Khezzani, 2018). First, the Ghout is accomplished by digging the land surface to access the groundwater using traditional methods. Second, the farmer plants palm trees where the roots come into direct contact with water in the moist soil (Remini & Miloudi, 2021). In this case, palm trees grow and develop, and farmers do not have to irrigate them as they do in other arid regions (Agier, 1949; Bouchemal, 2021; Senoussi et al., 2012). Therefore, this system depends on the stability of the groundwater level (Pulido-Bosch et al., 2018).

*Figure 1.* Aerial view of the Ghouts system surrounding a side of El Oued city, the capital of the Souf oasis (the first half of the twentieth century).[1]

*Source: Direction of Tourism and Handicrafts, El Oued.*

The Ghout system helps create a microclimate suitable for farming some vegetables and fruit trees under the date palm trees, which would not have succeeded in normal external conditions (Bouguedoura et al., 2015; Zella & Smadhi, 2006). The traditional farming production systems were in balance with the rural communities and the surrounding natural environment (Sun et al., 2013). However, the rise of globalization has brought many changes to contemporary society. In food production systems, the agricultural paradigm focused on agricultural intensification has detracted from traditional agroecosystems, so much so that the latter is under threat of disappearing (Arnes Garcia et al., 2020).

[1] Note the size of the Ghout system compared to the houses' size to realize the amount of sand extracted by simple means by the first local farmers to settle in the Souf oasis. Côte (2006) estimated that the amount of sand was equivalent to 186 million cubic meters.

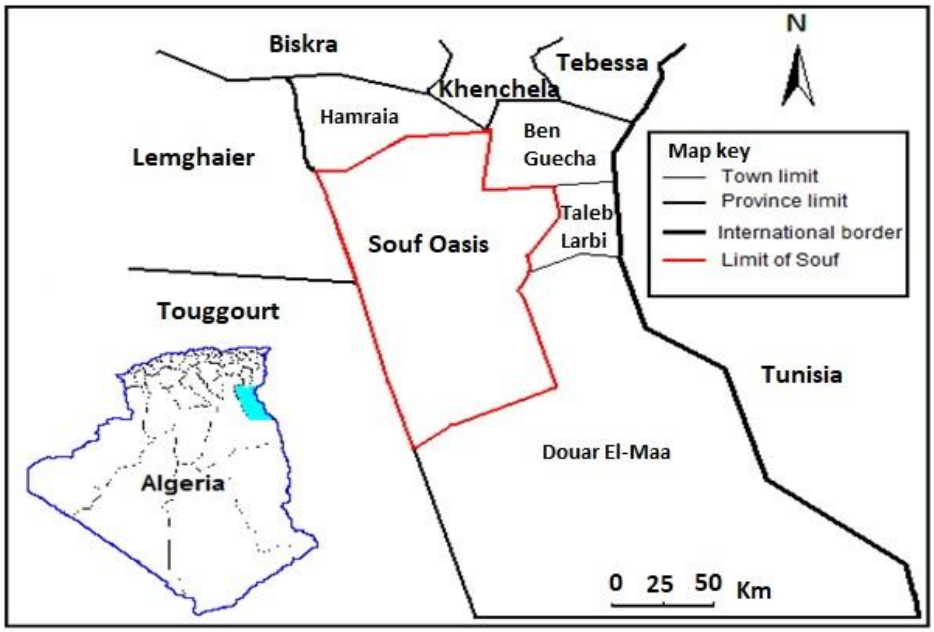
Theoretically, owners of traditional classified agricultural systems are assumed to be aware of this procedure. However, we have some doubts concerning this subject. Thus, the main goal of this investigation study is to determine whether local farmers in the Souf oasis are aware that their agricultural systems (the Ghout) are classified as GIAHS. Also, we will try to identify some factors that control this knowledge.

## 2.0 Materials and Methods

### *2.1 Study Area Description*

Souf oasis is located in the central part of El Oued province (south-eastern Algeria) (see Figure 2) and occupies about 11738.4 km$^2$ (22.8%) of the total province territory (Khezzani & Bouchemal, 2016). The climate of the study area is hyper-arid, characterized by a hot and dry summer and a mild winter. The rainfall is low, sporadic, and oscillatory, with an annual average of about 70 mm and rarely reaching 100 mm. On the other hand, the yearly evaporation can exceed 2200 mm. Monthly temperatures averaged 36.9°C during the summer and 14.3°C during the winter, with a yearly average of 26°C (Khezzani, 2018). The monthly relative humidity averages are usually about 30% during the summer (July and August) and may reach up to 65% during the winter (December and January). Winds are usually mild, but they become violent in the spring and autumn. All these indicators are witnesses to the aridity and cruelty of the climate in this part of the Sahara (Khezzani & Bouchemal, 2017).

*Figure 2.* Study area location.




*Source: Authors.*

### *2.2 Description of the Study Population*

According to the statistics for 2018, the Souf oasis contains 623500 inhabitants, representing about 94.5% of the total province population. Therefore, the population relative density in the Souf oasis is estimated at 53.11 inhabitants per km$^2$, compared to 18.46 inhabitants per km$^2$ for the whole province. Life in this oasis is based on irrigated agriculture and livestock breeding (Khezzani et al., 2019a). In the past, those activities have been characterized by a subsistence

nature, but now they have developed to become commercial (Khezzani et al., 2019b). The percentage of males is slightly higher than that of females, at 51% and 49%, respectively. Furthermore, the region has a birth rate of around 3.43 against 0.32 for the death rate. The active population proportion is nearly 42.78%, of which 38.48% is in the agricultural and livestock sectors (Khezzani et al., 2021).

### *2.3 Data Collection and Methodology*

Between 2018 and 2020, a sample of local farmers who own the Ghout system was tested through a survey based on a questionnaire designed for this purpose. The first section of the questionnaire contained the main information of the participants, such as their age group (26–40 years, 41–55 years, 56–70 years, and 71–85 years), gender (male or female), and educational level (no formal education, primary education, secondary education, and university education).

The second section of the questionnaire contained a straightforward question: "Did you know that the Ghout system that you own is classified as GIAHS by the FAO?" The programmed answers were *"*Yes*" or "*No.*"* If the answer was *"*Yes,*"* another question was raised about the source of this information. For the second question, the most likely answers are RTV media (radio and television), the press, friends, social media, and administrative authorities.

The category that knew the classification subject and who answered "Yes" will be denoted by the *(CAT-Y)* symbol. In contrast, the category that did not know the classification subject and who answered "No" were be marked by the symbol *(CAT-N).* We used a chi-square ($\chi 2$) test with *p-values < 0.05* for the significance level. The statistical analysis was performed using SPSS software Version 20. The graphs were performed using Microsoft Excel version 2021.

## 3.0 Results

### *3.1 General Characteristics of the Participants*

This field investigation included 397 farmers owning the Ghout system in the Souf oasis. Participants ranged from 27 to 84 years old, with a median age of 59.5 ±13.4 years. About 38.3% (152) of participants belonged to the age group 56–70 years, followed by the age group 41–55 years with 25.7% (102) and 24.9% (99) for the 71–85-year age group. Only 44 participants (11.1%) were aged 26–40 years. Further, about 37.5% (149) of participants don't have any formal education, 24.2% (96) have primary education, 25.2 % (100) have secondary education, and 13.1 % (52) have a university education. The participants' gender was 99.2% (394) for males versus 0.8% (3) for females (see Table 1).

### *3.2 Factors Affecting Farmers' Knowledge Related to the Ghout Classification*

Table 1 shows that only 12.3% (49) of farmers *(CAT-Y)* know that their Ghouts have been classified by the FAO as GIAHS, compared to 87.7% (348) who do not know anything concerning this subject *(CAT-N).* The ages of *(CAT-Y)* ranged between 28 and 76 years, with an average of 48.8 ±11.8 years, where most of them belonged to the age group 26–40 years with 27.3% (12/44), followed by 18.6% (19/102) for the 41-55 years age group, and 10.5% (16/152) for the 56–70 years age group. Only 2% (2/99) of *(CAT-Y)* were between the ages of 71 and 85 years. Farmers' knowledge is significantly influenced by their age *($\chi 2=23.003$, p-value=0.000).*

For gender criteria, about 12.4% (49/394) of individuals of (*CAT-Y*) were male against 0% (0/3) were female. In addition, the gender factor does not have a significant effect on the gained information by farmers *(χ2=0.426, p-value=0.514)* (see Table 1). Concerning the level of education criteria, about 36.5% (19/52) of *(CAT-Y)* had a university education level, followed by 21% (21/100) for the secondary level and 6.3% (6/96) for the primary level. Only 2% (3/149) of (*CAT-Y)* did not have any formal educational level. Therefore, the education level factor significantly affected the information gained by local farmers *(χ2=530.53, p-value=0.000)* (see Table 1).

Table 1. *Descriptive Characteristics of Participants and Factors Associated with Positive Answers Among the Local Farmers in the Souf Oasis*

| **Variable** | **Frequency** | **Positive answers N (%)** | ***χ2-value*** | ***p-value*** |
|---|---|---|---|---|
| **Total sample** | 397 | 49 (12.3) | | |
| **Age group (year)** | | | **23.003** | **0.000** |
| 26–40 | 44 | 12 (27.3) | | |
| 41–55 | 102 | 19 (18.6) | | |
| 56–70 | 152 | 16 (10.5) | | |
| 71–85 | 99 | 2 (2) | | |
| **Gender** | | | **0.426** | **0.514** |
| Male | 394 | 49 (12.4) | | |
| Female | 3 | 0 (0) | | |
| **Educational level** | | | **530.53** | **0.000** |
| No formal education | 149 | 3 (2) | | |
| Primary education | 96 | 6 (6.3) | | |
| Secondary education | 100 | 21 (21) | | |
| University education | 52 | 19 (36.5) | | |

On the other hand, A strong positive correlation was noted between farmers' age and their knowledge related to Ghout classification *(r = 0.97).* In contrast, a strong negative correlation was noted between farmers' educational level and their knowledge of the Ghout classification *(r = -0.99).*

## 4.0 Source of Information About the Ghout Classification

Figures 1 and 2 reported that about 65.3 % (32/49) of farmers have learned about the GIAHS classification from social media, followed by 18.4% (9/49) from RTV media, 8.2% (4/49) from friends, 6.1% (3/49) from administrative authorities, and 2% (1/49) from the press. Social media, followed by RTV canals, were the most favorable media for farmers with university and secondary education levels and aged 26–40 and 41–55 years. However, RTV media were more suitable for farmers aged 56–70 with a secondary or primary education level. On the other hand, the local administrative authorities, the press, and friends played a limited role in introducing the GIAHS to the local farmers.

*Figure 3:* Knowledge source according to the farmers' age group.

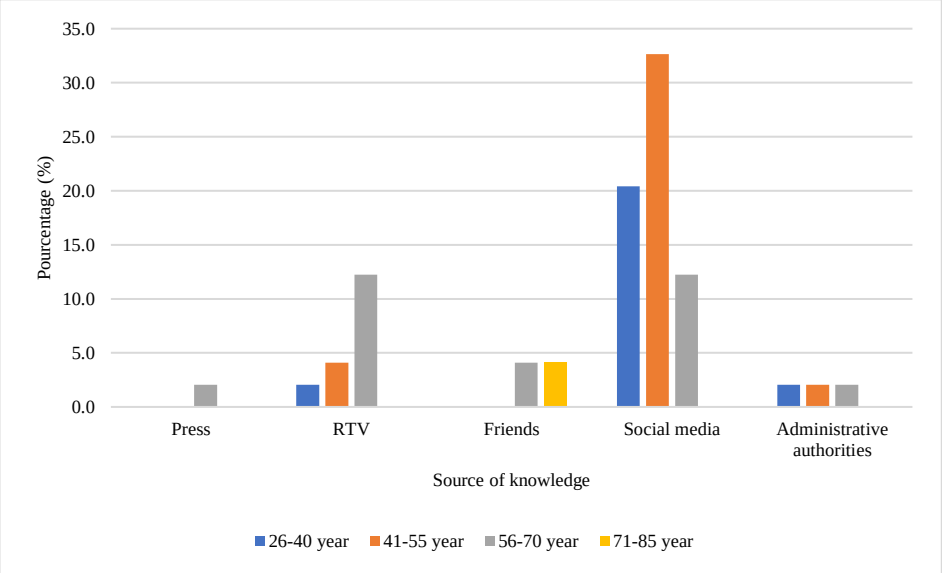
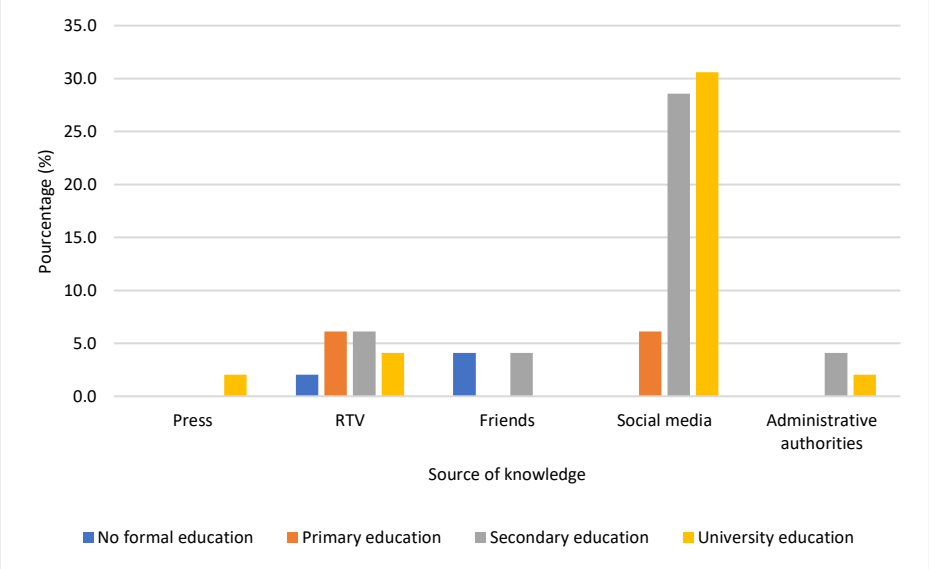



*Figure 4:* Knowledge source according to the farmers' educational level.



## 5.0 Discussion

Agriculture through the Ghout system was the only way that enabled the first inhabitants to settle in the Souf region. Some historical sources indicate that the establishment of this system dates back to the fifteenth century in the village of Zgum (Khezzani, 2007). Khezzani and Bouchemal (2018b) reported that local farmers carried out about 9800 Ghouts throughout the Souf oasis. The presence of an aquifer nappe covering the entire oasis can explain the widespread of this agricultural system in the study area.

Although the FAO has classified the Ghout system since 2005, most stakeholders could not know that their Ghouts had become a GIAHS site. These results confirm the existence of a large communication gap between farmers and administrative interests in the oasis. This situation may be due to the absence of a clear development policy that develops and preserves the GIAHS. Also, perhaps all attention is directed mainly to the modern agricultural sector. However, the studies by Khezzani et al. (2019a) and Rebai et al. (2017) have indicated that the Souf oasis witnessed a farming revolution by introducing new crops such as olives, potatoes, and wheat.

The agricultural sector employs a wide range of age groups in the Souf oasis. The young farmers have been able to know that the Ghout has become a GIAHS, whereas the older cultivators were unable to gain this information. The high educational level was a helpful factor in acquiring this information through various available means, mainly social media and public media (RTV). Social media has succeeded to a large extent in introducing agricultural heritage and communicating information to farmers because it is easy to use, rapidly spread, and available at a meager cost or free.

However, many studies have pointed out a strong relationship between the older farmers and this agricultural system. This is because perhaps some of them have already contributed to establishing this system; or because they knew that this farming system was the only way to ensure food security for the oasis inhabitants in the past during the crisis periods (Côte, 2006; Januel, 2010), especially during the French occupation. But unfortunately, this type of relationship between the Ghout and the farmer is rare or completely absent among young farmers.

It must be recognized that cohesion within the Ghout system survived for centuries but is now being threatened by various processes, such as urban sprawl (Abdaoui et al., 2020; Khezzani, 2015), the fluctuation of phreatic aquifer level (Remini & Souaci, 2019), and date palm aging (Bouguedoura et al., 2015; Khezzani, 2018). Moreover, although many Ghouts disappeared, what remains of them, are, to some extent, the primary source of income for many families in the oasis (Khezzani et al., 2016).

Many studies confirm that the local communities are an integral part of the GIAHS and are crucial actors in its operation and conservation (Sun et al., 2013; Sun et al., 2010). The results of this study can explain, to some extent, the continued deterioration of the Ghout system as a GIAHS in the study area. Therefore, the local authorities and decision-makers should move quickly to draw up a practical conservation and development policy both in the short and long term that attaches great importance to the local agricultural heritage. Nan et al. (2021) focus on the role of the farmer's community in managing and conserving the GIAHS and its related services and report that their understanding of the system's significance, as well as its culture and diversity, has a significant influence on conservation efforts.

Because no policy can succeed without the real stakeholders, the owners of the Ghouts, the first challenge for local authorities is to let farmers know that their farming systems have become a GIAHS of global concern. A special awareness program should be adopted that responds to the needs of the different age groups and different educational levels of local farmers.

At present, all GIAHS sites in the Souf oasis are owned totally by private owners, who manage and determine its destiny according to their narrow interests (Khezzani, 2015). Also, Khezzani (2022) reported that the best management of this heritage firmly imposes on us the involvement of several involved parties, the farmer in the first range and some administrative authorities, such as the directorate of agricultural affairs, as responsible for this sector. In addition, this network can include the directorates of tourism, the environment, and the forests. This type of joint management will certainly help protect and develop this heritage under the principles of sustainable development. A detailed master plan of the joined management principle implementation was established by the authors and discussed in a research paper under the title "The joint management principle as a tool to manage and preserve the globally important agricultural heritage systems (GIAHS): The Ghout system in the Souf oasis (Algerian Sahara)" which now is in the process of being published.

Decision-makers must be aware of the importance of preserving this type of GIAHS site in this sensitive environment. It is enough to make this project economically profitable for the local farmers, and the wheel of development and conservation will automatically move. In this context, we recommend that we can benefit from the Chinese experience in the management and conservation of the GIAHS, especially those related to the incentive system (Canqiang & Moucheng, 2014).

## 6.0 Conclusion

The Ghout is a traditional production and irrigation system; its historical, ecological, and socio-economic importance has led to its classification and conservation as a GIAHS by the FAO, not only for the local population but also for all humanity. Although the Ghout system has been classified as GIAHS for about 15 years, most of the Ghouts' owners do not know anything about the classification matter. This study indicates the presence of a big communication gap between the local farmers, especially the owners of the Ghouts, and the agricultural and administrative authorities; this is reason enough to undermine efforts to develop and preserve this type of GIAHS.

No development policy can succeed if stakeholders are neglected. Therefore, spreading awareness among farmers of the importance of the Ghout system as a GIAHS will inevitably help develop and preserve it. In this regard, social networking sites and newscasts can be good ways to carry out awareness-raising campaigns. More studies are needed on this subject at the local level. Furthermore, such a study can be conducted at different GIAHS sites worldwide to determine the extent of this phenomenon and to suggest solutions to it by the regional and international administrative authorities in charge of the GIAHS.

To our knowledge, this is the first study dealing with the issue of whether local farmers who own traditional agricultural systems are aware that these systems have become GIAHS. This research can be useful for politicians and decision-makers as it is a starting point for planning any policy aimed at preserving the GIAHS.

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