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Demographics of indigenous bovine cattle farms in Greece, Tunisia and Algeria

D. Tsiokos^{1,*}, A. Bousbia^{2,3}, A. Mohamed-Brahmi⁴, Y. Gueroui⁵, S. Smeti⁶,
S. Boudalia^{2,3}, S. Ben Said⁴, M. Anastasiadou¹ and G. Symeon¹

¹Research Institute of Animal Science, HAO-Demeter, P.O. Box 58 100, 57 001 Pella (Greece)

²Département d'Écologie et Génie de l'Environnement, Université 8 Mai 1945,
P.O. Box 24 000, Guelma (Algeria)

³Laboratoire de Biologie, Eau et Environnement, Université 8 Mai 1945, P.O. Box 24 000, Guelma (Algeria)

⁴Ecole Supérieure d'Agriculture du Kef, Laboratoire de Durabilité des Systèmes de Production
dans La Région du Nord-Ouest, Université de Jendouba, 7100 Le Kef (Tunisia)

⁵Département des Sciences de la Nature et de la Vie, Université 8 Mai 1945,
P.O. Box 24 000, Guelma (Algeria)

⁶Laboratoire de Productions Animales et Fourragères, INRA-Tunisia,
P.O. Box 2049, Ariana (Tunisia)

*e-mail: tsiokosd@rias.gr

Abstract. Indigenous cattle in the Mediterranean are an integral part of rural societies and ecosystems, as well as, a major source of animal products and income. The present article presents the results from 318 questionnaires developed in the BOVISOL project, in indigenous cattle farms in Greece, Algeria and Tunisia. Demographic information on the farmers, details on the farms, as well as a general description of the production systems are presented and discussed. Farmers, in all three countries have high average age, low to average education level and most of them have a successor in the farm. The farm infrastructures as well as the production characteristics are close to the traditional profile and interconnected to the local climatic and social conditions. Additionally, through the answers gathered, it is apparent that the farms have low cooperation and involvement in production recording schemes or conservation programs. The common problems and goals identified in the present work gives the possibilities to find mutual solutions for present of future issues and emphasizes the need to encourage cooperation between farmers in national and international level.

Keywords. Indigenous cattle – Mediterranean – Farm characteristic – Farming practices.

Démographie des élevages des bovins locaux en Grèce, Tunisie et Algérie

Résumé. Les bovins locaux en Méditerranée constituent une partie intégrale des sociétés et des écosystèmes ruraux, ainsi qu'une source non négligeable des produits animaux et des revenus agricoles. Ce travail présente les résultats de 318 questionnaires réalisés dans le cadre du projet BOVISOL sur l'élevage bovin local en Grèce, en Tunisie et en Algérie. Les analyses statistiques se basent sur l'étude des données démographiques des éleveurs, les caractéristiques des exploitations ainsi que la description générale des systèmes de production. Les résultats obtenus montrent que cette activité est familiale et héritée de père en fils. Elle est généralement assurée par des éleveurs d'un faible niveau éducatif et d'une moyenne d'âge élevée. La structure des exploitations ainsi que les caractéristiques des systèmes de production demeurent archaïques et dépendent des conditions climatiques et sociales locales. De plus, les réponses collectées montrent une faible implication des éleveurs aux programmes de contrôle laitier et d'amélioration génétique. Les résultats de ce travail donnent la possibilité de trouver des solutions communes à court et à moyen terme pour les présents et futurs défis, en mettant l'accent sur la coopération entre les éleveurs dans le cadre des programmes agricoles nationaux et Internationaux.

Mots-clés. Bovins locaux – Méditerranée – Caractéristiques des exploitations – Pratiques d'élevage.

I – Introduction

Represented by a worldwide population of about 1.4 billion animals, cattle are a major source of animal products and an integral part of human society (Felius *et al.*, 2014). As with other domestic livestock species, their dispersal over different continents led to a large diversity of breeds, with characteristics bound to local conditions, resources, and needs (Felius *et al.*, 2015). Their wide variety of characteristics, acquired through the course of time, have important cultural, historical, socio-economic and environmental value and, the once the most popular breeds in their specific regions are threatened by more productive specialized breeds during the last century and especially in the present (FAO, 2015). Nevertheless, in the recent past a growing awareness of the need of minimizing loss of genetic resources (Hiemstra *et al.*, 2010). has been achieved and a great deal of work is realized towards the conservation of local breeds (FAO, 2015).

In Greece, the majority of local cattle is represented by four breeds: the “Greek Red” (with a population of about 35,000 females), “Vrahykeratiki” (Shorthorn, with approximately 9,300 females), “Katerinis” (with approximately 700 females) and “Sykias” (approximately 300 females, endangered breed). Four Greek breeds are considered as officially extinct (Tinos, Andros, Chios, Kerkyra), the three previously mentioned as threatened (Vrahykeratiki, Katerinis and Sykias) and one (Kea) as nearly extinct. (Domestic Animal Diversity Information System, 2020) The Greek breeds are farmed exclusively for meat production, mainly in the mountainous grasslands of the country. They are reared most of the time in the fields and they are housed only in winter. Their dietary needs are covered mostly by grazing and complementary feed is provided only in the winter.

In Tunisia, local cattle population with Iberian origin counts 191,920 female Units and are mainly (87%) localized in the North especially in the mountainous area (120,000 heads). In this zone, local cattle breeds contribute from 15 to 26% to the milk and meat production. In fact, two breeds are identified: Atlas Brown and Blonde of Cap Bon. The size of Atlas Brown has been declining over the years while the size of the Blonde of Cap Bon is very small indicating that it is exposed to extinction (Baccouche *et al.*, 2014).

Algerian autochthonous bovine populations resemble the Brown Atlas, whose pure breed subjects are still preserved in the mountainous regions. It is subdivided into several subpopulations, namely “Guelmoise”, “Cheurfa”, “Krouminiène”, “Chelifienne”, “Sétifienne” and “Djerba”, which are clearly phenotypically differentiated. The size of these populations has been estimated by the RGA (MADR, 2001) at nearly 896,287 subjects. These populations are characterized by good rusticity, constitute a very important socio-economic element, and contribute to a large part to the feeding of the rural people. Importation of exotic breeds, led to a profound mutation in the genetic structure of the dairy herd in Algeria, resulting in a drastic fall in the numbers of local cattle (Wilson, 2018).

The aim of this study was the evaluation of the current situation in local cattle farms in three Mediterranean countries (Greece, Tunisia and Algeria), in terms of demographics and production systems, using the method of personal interviews with the farmers.

II – Material and methods

This study was contacted in the framework of the BOVISOL (Breeding and management practices of indigenous bovine breeds: Solutions towards a sustainable future) project. The BOVISOL project (2018-2021) is a cooperation of scientific teams from Greece, Tunisia and Algeria and has been formed around the hypothesis that the local bovine breeds must be preserved since they possess a valuable genetic pool and they are a part of the landscape and the biodiversity of rural areas (Boudalia *et al.*, 2020). All protocols were approved by the local Data Protection Board (DPB) or the local ethics committee in Greece, Tunisia and Algeria. The study involved data collection from dif-

ferent farms. The participants were informed of the purpose of the project and they have given their consent for their participation and the use of data collected and generated for scientific publications.

This study presents information collected, through individual questionnaires developed in the BOVISOL project, in indigenous cattle farms in Greece (43 farms), Tunisia (100 farms) and Algeria (175 farms). The questionnaires collected demographic information on the farmers, details on the farms, breeds, animals' performance, production systems and market channels. For the purpose of this paper, demographic information is presented, as well as a general description of the production systems. The data were coded, entered a database, corrected and validated by the research group, before being submitted to statistical analysis using IBM SPSS Statistics package version 25 (IBM SPSS, 2017) was used to produce the statistical figures and tables.

III – Results and discussion

1. The farmers

Table 1 shows the age distribution of the farmers in the three countries according to the questionnaire results. It is apparent that Algeria has the most aged farmers with over 60% over the age of 50. Greece has the least aged farmers with 64.4% under the age of 50, while the Tunisian age distribution is more balanced. The age differences of the farmers are projected at their marital status with 20% of the Greek farmers being single while the same figure in the other two countries is less than 10%. It is also interesting that in Algeria and Tunisia more than 50% of the farmers have 4 children or more, while in Greece almost all the farmers have 3 children or less (97.7%). When asked if there is a successor in the farm Algerian and Tunisian farmers confirmed a successor in over 70% of the cases, compared to about 50% of the Greek farmers, which is in accordance with the previous figures.

Table 1. Age distribution of the farmers in countries (in years)

	<= 30	31-40	41-50	51-60	61-70	71-80	81+
Greece	7.3%	17.1%	39,0%	24.4%	7.3%	4.9%	0.0%
Tunisia	8.0%	14.8%	27,3%	20.5%	23.9%	4.5%	1.1%
Algeria	1.7%	15.4%	22,3%	24.6%	23.4%	11.4%	1.1%

The education level of the farmers (Table 2) is higher in Greece where there are no illiterate farmers and more than 50% of them have finished primary or high school, which is in accordance with the younger age of most of the farmers. In Algeria and Tunisia there is a higher percentage of illiterate farmers and a small percentage of farmers that have finished high school. Additionally, in all three countries none of the farmers have any kind of education related to animal production.

Table 2. Education level of farmers

	Illiterate	Primary school	Middle school	High school	Technical	Higher
Greece	0.0%	41.9%	0.0%	37.2%	14.0%	7.0%
Tunisia	62.0%	29.0%	7.0%	0.0%	0.0%	2.0%
Algeria	39.4%	34.9%	19.4%	5.7%	0.0%	0.6%

As shown in Table 3 the farmers in all three countries have significant experience since more than 70% of them work 10 or more years in the field, with the higher percentage represented in Algeria (96.6% with 20 years or more of experience). On the other hand, Greece and Tunisia have both significant populations of relatively new farmers with experience of 10 years or less (Table 3).

Table 3. Experience in animal breeding and occupation type

	Experience in animal breeding				Occupation type	
	<5 Years	5-10 Years	10-20 Years	>20 Years	Full Time	Part Time
Greece	9.1%	15.2%	27.3%	48.5%	100.0%	0.0%
Tunisia	2.3%	26.1%	42.0%	29.5%	84.0%	16.0%
Algeria	0.6%	2.9%	29.7%	66.9%	56.6%	43.4%

In Greece, farming is the sole occupation for all the farmers, while in Algeria and Tunisia significant part of them is occupied in animal production as a part time job. Probably, the acquired income from farming is higher in Greece, allowing the farmers to use it as their sole occupation.

When asked about the reason the farmers chose animal production (Table 4) most of the farmers chose, among others, heritage (Algeria and Tunisia) and attachment to the farming activity (Greece). Both answers reflect on the continuation of the profession from their fathers, as it is also apparent in Table 4 where most of the farmers in all three countries have been taught by their father.

Table 4. Reason of choosing local cattle breeding activity (multiple answers) & source of knowledge

	Reason of choosing local cattle breeding activity (multiple answers)				Source of knowledge on this activity		
	Heritage	Love for farming	Profit	No other activities	Alone	Father	Other farmers
Greece	46.3%	61.0%	39.0%	0.0%	31.0%	64.3%	4.8%
Tunisia	85.0%	0.0%	9.0%	6.0%	12.0%	81.0%	7.0%
Algeria	72.0%	1.1%	30.3%	12.0%	17.1%	81.7%	1.1%

All the preceding characteristics of the farmers are in accordance to previous discussions regarding the sustainability of such pastoral agro-ecosystems (Bernues *et al.*, 2011; Ligios *et al.*, 2005). The high average age of the farmers surveyed (48 in Greece, 51 in Tunisia, 55 in Algeria) in conjunction with the absence of successors, especially in Greece, and the low education level, are indicators that could lead to the abandonment of such pastoral low-input systems (Lebacqz *et al.*, 2013).

2. The farms

According to the answers from the surveys (Table 5) the farm buildings in Algeria and Greece are mainly traditional loose housing, and more solid constructions in Tunisia. Regarding the water sources used, in most cases in all three countries, natural sources are used either directly or after storing in tanks (Table 5).

Table 5. Type of farm construction & water source for the farm

	Water source for the farm						Type of farm construction	
	Dam	Local water supply company	River	Spring	Water tanks	Well or drilling	Solid	Traditional
Greece	0.0%	26.2%	11.9%	0.0%	28.6%	33.3%	36.6%	63.4%
Tunisia	0.0%	0.0%	0.0%	3.0%	36.0%	61.0%	64.0%	36.0%
Algeria	1.1%	0.0%	42.9%	25.1%	1.1%	29.7%	35.4%	64.6%

With respect to feed cultivation (data not shown), in Tunisia most of the farmers in the study cultivate feedstuffs, especially hay and straw in order to provide feed to their flocks (pure bovine breeds, sheep and goats and local bovine animals), in contrast to Greece and Algeria, where the respective percentages are significantly lower (48.8% and 31.4% respectively).

On the other hand, as shown in Table 6, the main workforce in the farms is the family members, exclusively in Tunisia, and in high percentages in Greece and Algeria. Specifically, in Greece, 23.3% of the farmers use external workers periodically in the farms, an observation that denotes the more business character of the sector.

Table 6. Number of workers in the farm

	Number of family members working in the farm				Number of external workers in the farm	
	0	1	2	3-7	0	1-3
Greece	27.9%	25.6%	25.6%	20.9%	76.7%	23.3%
Tunisia	33.0%	34.0%	20.0%	13.0%	100.0%	0.0%
Algeria	34.9%	37.7%	16.6%	10.9%	94.3%	5.7%

The surveyed farmers in Tunisia and Algeria conduct no performance recording for their local bovine breeds and also have no participation in a genetic conservation program. On the other hand, 84% of the farmers in Greece have breeds in a genetic conservation program and 68% do performance recording, in the frame of national and/or EU programs.

It is obvious that in all three countries the infrastructures available are far from modern. Additionally, the partial technical consulting, the minimal to absent performance recording and participation in Genetic Resources Programs fail to provide better quality working conditions, improve the welfare and production characteristics and give a comparative advantage to the products (Bernues *et al.*, 2011).

3. Production systems characteristics

The production direction is closely connected to the breeds selected in each country (FAO, 2015). All the Greek farms in the questionnaire focused in meat production, and the majority of the farms in Algeria and Tunisia in both milk and meat production (79% and 87% respectively). A small percentage (6.9%) of the Algerian farmers chose breeding as their production direction. The most important reason for choosing the breeds in Algeria and Tunisia was the adaptation of the breeds in the local conditions (Table 7), not apparent in Greek answers indicating the more extreme climatic conditions in the African countries. Performance of the breeds was also important for Algeria and Greece and less selected in Tunisia. The subsidies were selected from few of the farmers in Greece and Tunisia indicating but a small role in their breed choices. Moreover, when questioned about having other breeds in the past few of the farmers in Algeria and Greece responded positively, in contrast with the Tunisian farmers that all of them had another breed in the past that changed seeking for more adapted breeds.

Table 7. Reason(s) of choosing the breed(s). (Multiple answers)

	Adaptation	Heritage	Performance	Technical Support	Subsidies
Greece	20.9%	27.9%	51.2%	0.0%	4.7%
Tunisia	100.0%	7.0%	19.0%	0.0%	2.0%
Algeria	72.6%	61.7%	53.7%	31.4%	0.0%

The production system is characterized by the free grazing of the animals and the periodical housing either in the night or in the winter or both. Specifically, winter housing is more common in Greece than in the African countries, obviously because of the different climatic conditions. In Tunisia, the animals are housed only at night while in Algeria, a large proportion of the animals is never housed (Table 8).

Table 8. Housing period

	Housed in the night	Housed in winter	Housed in the night and winter	Never housed
Greece	23.3%	25.6%	46.5%	4.7%
Tunisia	100.0%	0.0%	0.0%	0.0%
Algeria	38.9%	8.0%	0.0%	53.1%

When questioned about their daily and seasonal activities (Figure 1) the majority of the farmers in Greece and all of the farmers in Algeria and Tunisia performed daily grazing and seasonal feed supplementing, indicating the importance of grazing in all the countries. Milking is an important activity in Algeria and Tunisia, due to their production direction, and performed in only a few cases in Greece, mainly for the household needs. Castrating and dehorning was performed seasonally in Algeria and Greece, and never in Tunisia. It is also important to emphasize that, due to the nature of the production systems, in all three countries cleaning was performed seasonally.

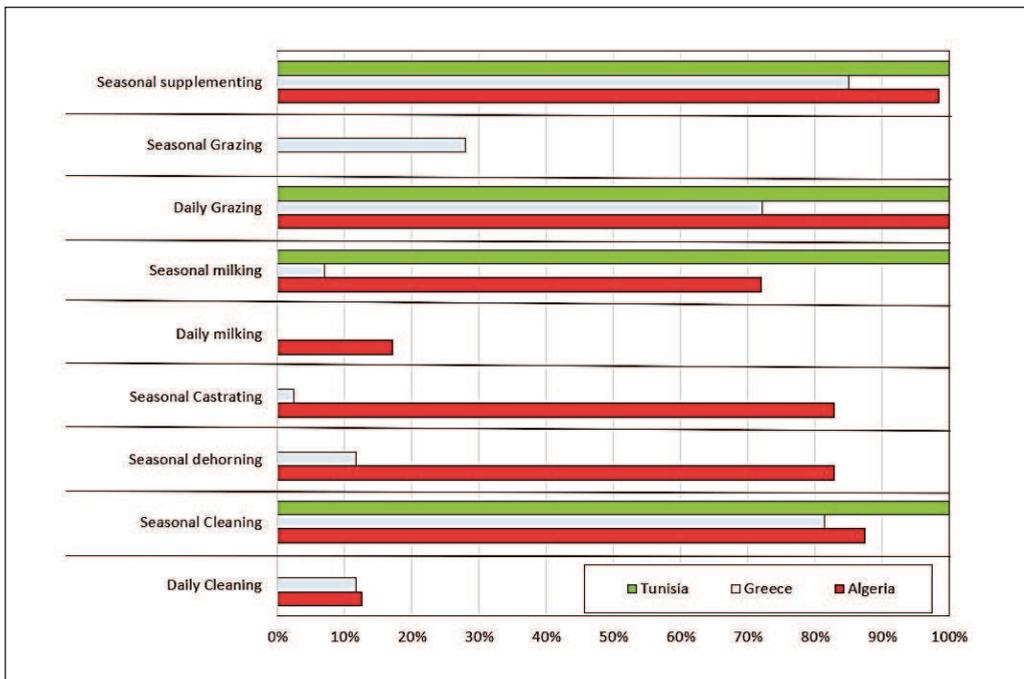


Fig. 1. Daily and seasonal activities of the farmers (% of the farmers).

IV – Conclusions

Besides all the difficulties and imperfections of the indigenous cattle farming systems in all three countries, it is important to emphasize that they are based on the rational use of local resources and allow the production of quality food (Manzano & Salguero, 2018). They are also an important part of rural economy especially in areas with strong environmental constraints, while the local breeds selected by the farmers have developed all the necessary traits to cope with them (FAO, 2015). These systems carry a lot of knowledge, traditions and strong cultural, social and heritage values transmitted through generations. Therefore, it is important to transform these systems while simul-

taneously maintaining all those characteristics that give them their unique traits. They need to evolve in parallel with all the social and economic challenges, the new technologies and the climate change in order for them to have all the necessary tools to cope with any upcoming risks in the future.

The work performed in the BOVISOL project, that this questionnaire is part of, aims to contribute to the sustainability of the local bovine breeds' farming systems by taking into account a) the adaptability of the animals to the local environment, b) the quality of the animal products and c) the economic and cultural value of the systems. The information and experienced share between the countries can be used to provide answers to common problems, as well as prepare the systems for the future (Gandini, *et al.*, 2004). This logic of cooperation and common troubleshooting is of utmost importance (Ligda and Zjalic, 2011) especially between the farmers of the same country, same area or same production system, since few of the farmers in the questionnaire were part of a cooperation which indicates the isolation of the farms from common goals and problem solving.

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