Original article

The Dynamic of Equine Farming in the Arid Mediterranean Area in Tunisia: Tradition Meets Modernity

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Abstract

This study aimed to characterize equine farming systems in the desertic Médenine region (Tunisia) based on a survey of 70 breeders. Equine farming is significant, with herds reaching up to 25 mares. Typically, farms have 1 to 3 horses, mainly for leisure and some commercial purposes. The survey found that all farmers are men, aged 22 to 42, with 67% having secondary education and agricultural training. Farms average 13.2 hectares, with 4.3 hectares dedicated to agricultural use and 0.295 hectares for horses, reflecting a system adapted to the region's climate.

The primary farming system is mixed, combining agriculture, livestock, and sometimes tourism. In addition to horses, goats, and cattle are raised for milk and meat. The main breeds are purebred Arabian and Arabian-Barb horses, selected for traits suited to both leisure and commercial needs.

The study identifies three equine farming typologies: (i) leisure, tourism, and popular games farming; (ii) foal commerce farming; and (iii) competition and racing farming. These typologies reflect different breeding goals, from cultural traditions to tourism and competitive markets. Despite limited land and resources, farmers use strategies such as external feed and advanced breeding techniques to maintain horse health and productivity. Overall, the study provides a comprehensive overview of the equine farming systems in the Médenine region, including farmers' demographics, farming structures, breeds, and typologies.

Keywords: Equine, Tunisia, Farming System, Desertic Area.

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INTRODUCTION

Equine breeding holds significant importance in Mediterranean regions, playing a key role in both cultural and socio-economic aspects (Miraglia, Burger et al. 2006, Aroua, Fehri et al. 2024, Blanco-Doval, Barron et al. 2024). Horses have long been a symbol of prestige and heritage. (Horton 2017), with various breeds raised for multiple purposes including sport, work, and tourism.

Despite the challenging environmental conditions, horses, particularly the Barb and Arabian-Barb breeds, have shown remarkable adaptation to arid climates (Berber, Gaouar et al. 2014). These breeds are well-suited to the harsh terrain and climate of the desert, known for their stamina, endurance, and ability to withstand extreme heat and limited water resources. Historically, horses in these regions have been used for transportation across vast distances, particularly in nomadic lifestyles and transhumance (Dong 2016), helping herders move livestock and goods between pastures and settlements. Today, they continue to be used in traditional desert activities, such as cultural events and tourism.

In terms of utilization, horses in Tunisia are involved in various sectors. They are essential in traditional farming systems, where they serve agricultural labor, transportation, and, increasingly, leisure activities. (Jemmali, Haddad et al. 2017, Aroua, Chafri et al. 2025).Horses are also vital to tourism in desertic areas, attracting visitors seeking unique experiences like desert trekking or participating in traditional equestrian events such as the "Fantasia" shows (Notzke 2019). In peri-urban areas, small-scale breeders raise horses for these purposes, often combining horse husbandry with other agricultural activities (Elgåker 2012, Hammer, Bonow et al. 2017).

Equine breeding systems vary globally but can be categorized into extensive and intensive systems. In many European countries, modern breeding is often conducted on small plots of land in peri-urban areas, focusing on breeds for leisure and sport. (Rzekęć, Vial et al. 2020). Tunisia shares similarities with these systems, particularly in desertic regions, where space constraints and climate challenges are counterbalanced by the adaptability of native breeds. The Arabian Barb, in particular, thrives in the arid environment and is highly valued not only for traditional uses but also for tourism and recreational activities. Moreover, foal commerce farming, which specializes in producing horses for racing, show jumping, and leisure, is a growing industry that mirrors developments in Europe. However, no study, to our knowledge has characterized the equine farming system in Tunisia. Thus, this study aimed to characterize the typology of equine breeding in Tunisia, particularly in the south part of the country.

MATERIALS and METHODS

A survey was conducted to investigate the typology of equine breeding systems in the desertic Mediterranean region of Médenine, in the eastern south of Tunisia between March and June 2023. The primary objective of this study was to classify and analyze the breeding methods and strategies

employed by local horse breeders in this arid environment. A structured questionnaire was designed based on the framework established by (Aroua, Ben Said et al. 2021, Aroua, Chafri et al. 2025). To ensure the relevance of the questions concerning the study objectives, a reliability test was conducted through a pre-test with a small sample of breeders. This pre-test allowed for identifying and adjusting any ambiguous or poorly understood questions. The survey targeted a representative sample of 70 breeders, covering the regions of Djerba, Zarzis, Ben Guerdane, and Médenine (Figure 1).

Figure 1. Study area

These areas are characterized by a dry, Mediterranean climate, marked by hot summers, mild winters, and limited rainfall. The temperature can vary significantly, with extreme heat during the summer months and cooler temperatures at night. Given the scarcity of water resources, the challenging terrain, and the harsh climatic conditions, local farmers have adapted their equine breeding practices to ensure the sustainability of their operations.

The primary objective of the survey was to gather comprehensive data on the demographic characteristics of the breeders, as well as their farming methods, feeding practices, and the types of horses they raise. The questionnaire collected information on the age, education level, and experience of the breeders, alongside detailed insights into their equine management practices. This included data on herd sizes, breeding techniques, and feeding strategies specifically adapted to the desertic conditions of the region.

To recruit participants, the "snowball" sampling method was employed. This approach began with identifying a few initial breeders who then recommended other breeders to participate in the study. The "snowball" method proved particularly effective in reaching farmers located in remote and rural areas of the desertic Mediterranean region where traditional methods of communication and networking are often the most reliable means of outreach (Okeoghene and Odemero 2016).

Statistical Analysis

Descriptive statistical analysis was performed using Microsoft Excel 2007. Following this step, Multiple Factor Analysis (MFA) and Hierarchical Clustering Analysis (HCA) were used to identify and categorize the different types of equine farming systems based on the collected data. These methods allowed the researchers to group the breeders into distinct categories based on similarities in their breeding methods, herd sizes, feeding practices, and adaptation strategies to the desert environment using Xlstat software(XLSTAT 2013).

RESULTS and DISCUSSION

The data collected underscores the pivotal role of horse breeding in the arid Mediterranean region, particularly in areas with a strong historical tradition of equine husbandry. Notably, herd sizes are larger in Djerba, where some farms house up to 25 mares. However, the majority of farms currently maintain between 1 and 3 horses. Additionally, our findings indicate a growing number of breeders, reflecting the emergence of new uses for horses, particularly in leisure activities and, to a lesser extent, commerce.

The study revealed that 55% of the equine population consisted of mares, while 45% were stallions and foals. The mares age ranged from 24 to 288 months, with an average age of 84 ± 14 months. The average age at first foaling for mares was 60 ± 5 months. Male horses ranged from 36 to 120 months, with an average age of 60 months. Horses typically reach puberty at around two years of age, although breeding usually does not occur until they are four years old.

The breeding season extends from February 15 to June 15, with 53% of natural breeding occurring freely at the stud farm of Ben Guerden (or the mounting station of Ben Guerden), primarily for saddle and tourism horses. Artificial insemination is predominantly used for racehorses.

Breeders reported a diverse range of uses for their horses: 13% are dedicated to tourism, 63.7% are used for racing and competitions, and 13.3% are kept for socio-cultural purposes, such as traditional equestrian games like "fantasia" and "medwri."

The surveyed breeders are all men aged between 22 and 42 years, with an average age of 33 ± 5 years. Most of them (80%) have a secondary education and 67% have received agricultural training courses.

The average total agricultural area (TAA) of farms is 13.2 hectares, with individual farm size ranging from 0 to 40 hectares. Although horse breeding typically requires agricultural land(Askarov, Kuznetsova et al. 2020), some farms operate without any Off-ground. This is consistent with data from the National Agricultural Office of Tunisia (ONAGRI 2024), which shows that farms under 10 hectares own over 65% of Tunisia's equine population. On average, farms allocate 0.295 hectares to horse breeding, which is insufficient to sustain this activity without external feed sources. The variation in space per farm, combined with the small average area, suggests that horse breeding in the region largely depends on external feed due to climatic constraints. Despite the limited land, horse breeding can still thrive in this region through specific management systems. In many European countries, horse farms are successfully managed on smaller plots of land, often in peri-urban areas, using mono-breeding systems (Leslie 2013), These systems rely heavily on external feed sources and advanced management practices, enabling breeders to maintain high-quality stock without the need for vast grazing areas. This parallel demonstrates how adapted horse breeding methods can be applied in challenging environments, such as the desertic Mediterranean, making it possible to sustain equine farming even under spatial and environmental constraints (Aurich and Aurich 2006, Elgåker 2012).

Most breeders (64%) come from agricultural backgrounds, with horses typically housed in stalls (73.9%) or ranches located in tourist areas. The dominant production system in the study area is a mixed agriculture-livestock or tourism-livestock model, with livestock farming playing a vital socio-economic role. In the Mediterranean region of Médenine, farmers also raise various types of livestock, including cattle, sheep, goats, horses, and poultry. Goat and camel breeding are the most common due to their adaptability to the harsh, arid conditions where water and vegetation are scarce. These animals play a vital role in the local economy, and similarly, horse breeding has adapted to these conditions by relying on external feed sources and tailored management practices(Rather, Shanaz et al. 2020).

Goats represent the largest number of animals in this study, reflecting their economic importance. Local crossbred cattle are also significant, primarily for milk and meat production. In terms of horse breeds, purebred Arabian and Arabian-Barb horses dominate in the Médenine region, although their distribution varies across farms. Among breeders, 42% prefer purebred Arabian horses, citing factors such as morphology (41%), beauty (17%), and performance (39%) as key considerations. On the other hand, 58% of breeders prefer other breeds, such as Arabian-Barb and Barb horses, due to their resilience and the availability of these breeds, which are more widespread in the country. Additionally, the existence of champions in these breeds and their use in traditional equestrian activities, such as fantasia and mdawri, further drives their preference.

The feed calendar across farms shows similarities based on farming type, with barley, mineral-vitamin supplements, mash (a nutrient mixture), straw, and oat or fenugreek hay serving as primary food sources for horses. Diets are tailored to the specific needs of horses based on their activity. Tourism and
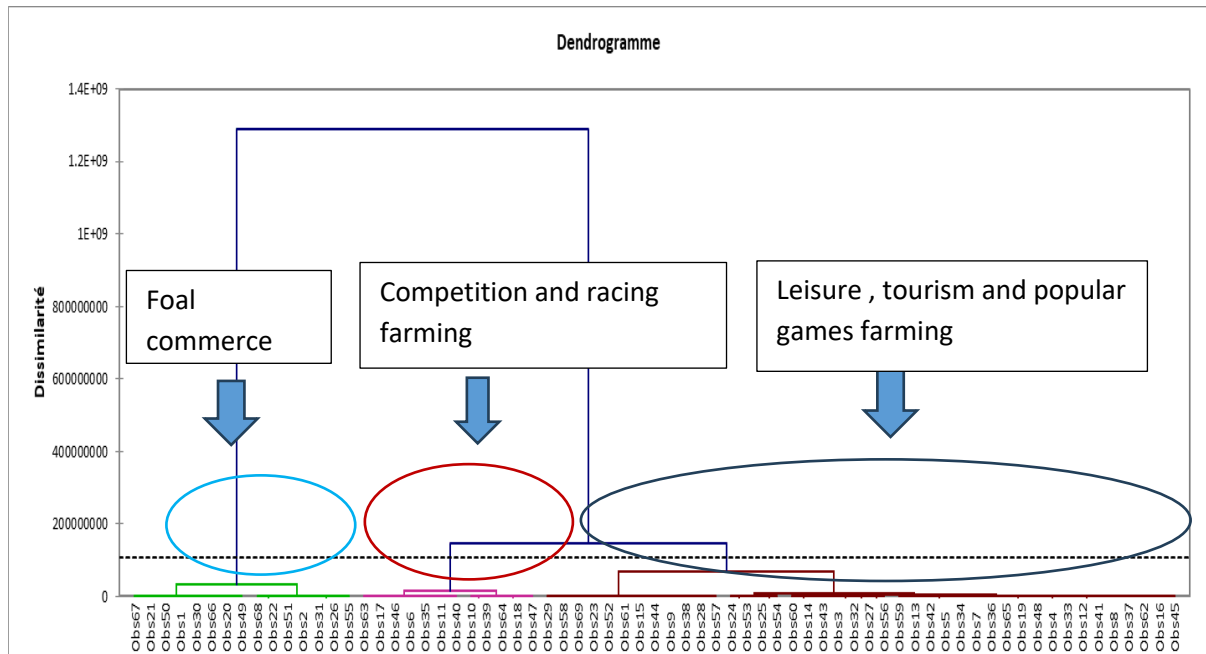
leisure horses are mainly fed oat hay, barley, and wheat bran year-round, while racehorses receive a more specific regimen including barley, faba beans, corn, wheat bran, mineral-vitamin, and vegetable oil, with oat and/or fenugreek hay as the staple.

All farms in the study meet their horses' energy, protein (MADC), and phosphorus (P) requirements according to (Sauvant, Perez et al. 2023) though calcium and magnesium deficiencies were noted, suggesting a need for vitamin- mineral supplementation and additional fibrous feed such as hay and straw.

The most common diseases among the equine population were colic (50%), parasitic infestations, and equine flu-like for all desertic horse breeds (Morales-Briceño, Oliva et al. 2020, Sazmand, Bahari et al. 2020). Traditional remedies, including medicinal plants such as eucalyptus, bay leaf, nettle, fenugreek, and coriander, were frequently used to treat internal gastrointestinal parasites, while henna was applied to skin conditions.

Characterization of Equine Farming Types in the studied Regions

Factor analysis revealed that two main factors breeding parameters (66.4%)and commercialization (14.1%) explained 80.8% of the total variability (Figure 2), with breeding parameters associated with the first axis and commercialization variables with the second.

Figure 2. Spatial representation of breeders by MFA

The spatial distribution of farmers (Figure2) reveals the presence of three groups of breeders, but the dissimilarity between them has not been determined. For this reason, a hierarchical ascending classification (HAC) was established and four types of breeding were identified (Figure 3)

Figure 3. Hierarchical classification tree breeders

Leisure, Tourism, and Popular Games Farming

A significant proportion of farmers (74.5%) in the region engage in horse breeding for leisure, tourism, and traditional games. These farms typically cover small plots (averaging 2 hectares), with approximately 500 m² dedicated to horse breeding and care. Despite the limited space, most farms maintain around two horses, effectively integrating horse husbandry with other agricultural activities.

The dominant breed in these farms is the Arabian-Barb, renowned for its resilience, stamina, and adaptability. This breed is particularly suited for the region's harsh conditions and plays a key role in both traditional farming and tourism. The Arabian-Barb's versatility, combined with its strong cultural significance and aesthetic appeal, makes it highly sought after for leisure activities, such as horseback riding, and for participation in traditional equestrian games, which attract tourists interested in local heritage.

A subset of farmers, primarily those focused on tourism, maintain larger herds, with some farms housing more than ten horses to meet the growing demand for tourism-related activities. These operations often cater to tourists seeking authentic experiences, including horseback riding and participation in traditional equestrian games like "fantasia" and "medwri." The Arabian-Barb's calm temperament and ease of training make it an ideal choice for tourism, where horses must be adaptable to various riders and skill levels.

To support the tourism industry, these farms invest more heavily in infrastructure. Larger herds necessitate expanded facilities, including stabling, grazing areas, and training spaces. Furthermore, tourism-oriented farms often provide amenities such as horseback riding trails, visitor accommodations, and event spaces. For many of these farmers, horses represent the core of their business, generating income through tourism and contributing to the preservation of local equestrian traditions.

This model of integrating horse breeding with leisure, tourism, and traditional games is common in Europe and globally, with small-scale farms playing a vital role in rural economies. The demand for versatile and well-trained horses, particularly breeds like the Arabian-Barb, has led to the growth of a thriving equine industry, providing both economic benefits and a means of preserving cultural heritage(Helgadóttir and Sigurðardóttir 2008, Kebede 2020, El Mahdaoui 2023)

Foal Commerce Farming

A smaller, highly specialized group of farmers—representing approximately 15.2% of breeders—focus primarily on breeding and selling high-quality foals. These breeders typically manage larger land areas, around 4 hectares, and their operations are more intensive compared to those focused on leisure and tourism. The breeding strategy centers exclusively on Arabian-Barb mares, a breed prized for its endurance, agility, and cultural significance. All mares in this system belong to the Arabian-Barb breed, with breeders aiming to maintain and enhance the breed's unique characteristics.

The breeding process in foal commerce farming is selective, utilizing advanced reproductive technologies such as artificial insemination (AI). AI enables breeders to access the genetics of champion stallions without the need for physical proximity(Stallones, McManus et al. 2023), ensuring that foals inherit superior traits like strength, speed, and aesthetic appeal. Champion stallions are chosen based on their pedigrees, competitive performance, and reputation within the breeding community(Vicente 2015). The use of AI ensures the quality of foals while allowing for more efficient control of the breeding process, minimizing the risks associated with traditional mating methods(Hafizov and Sciences 2024).

These farms prioritize quality over quantity, dedicating substantial resources to the care and development of mares and foals. The larger land area (4 hectares) allows for optimal conditions during gestation and after birth, with specialized facilities including stables, foaling areas, and training grounds. This space enables young horses to be nurtured and trained from an early age, ensuring they are well-prepared for future roles in breeding or competitive events.

The primary economic activity for these breeders is the sale of foals. Foals bred from champion stallions and raised with meticulous care are sold to other breeders, equestrian enthusiasts, or competitive horse sport participants. The foals' bloodlines and training enhance their market value, with buyers willing to invest in horses that have the potential to excel in competitions or serve as valuable breeding stock. The sale of these high-quality foals also contributes to the broader equine industry by

introducing superior genetics into the market, maintaining the prestige of the Arabian-Barb breed both locally and internationally.

Foals bred in this system often go on to compete in regional and international equestrian competitions, further solidifying the reputation of the breeders and the breed itself. Foal commerce farming thus represents a highly specialized and profitable sector within the horse breeding industry. By focusing on champion stallions and employing artificial insemination, breeders produce foals of exceptional quality, commanding high prices and contributing to the sustainability of the Arabian-Barb lineage. These farms serve as centers of excellence, preserving and enhancing the legacy of the Arabian-Barb horse for future generations.

This specialized form of breeding plays a crucial role in the global equine market. Foals represent the next generation of horses, with potential applications across various sectors, making them a valuable commodity in the global marketplace(Cabral, de Carvalho Peres et al. 2020, Vaakanainen 2021, Tanner and Barrell 2024)

Competition and Racing Farming

A specialized group of breeders, representing 10.3% of the total, focuses on competition and racing. These breeders manage larger farms, typically around 25 hectares, with 2.5 hectares dedicated to horse care and training. Their primary focus is the preparation of high-performance horses, particularly purebred Arabian and English horses, known for their speed, agility, and endurance, which constitute about 25% of the total equine population.

These farms maintain prestigious bloodlines, often descended from champion horses, to produce top-tier competitors for races and equestrian sports. Each farm typically houses around 16 horses, with intensive training aimed at enhancing physical conditioning and competitive performance. Breeders employ advanced techniques to prepare horses for peak performance in competitive environments.

In addition to breeding and training, many breeders also offer training services to Libyan horse owners, highlighting their international reputation. This cross-border collaboration allows Libyan owners to access top-tier training, while local breeders expand their clientele and strengthen their market presence.

The economic success of competition and racing farming depends on producing horses that excel in high-stakes events, which boosts both their market value and the prestige of the breeding farm. The growing demand for trained competition horses, particularly in racing-centric regions, further solidifies the importance of this niche in the equine industry.(Gottlieb, Weinert et al. 2020, Bell 2021, Legg, Gee et al. 2023).

CONCLUSION

This study highlights the diversity and specialization within equine breeding systems in the Mednine region, demonstrating that breeders have adapted their practices to meet the challenges of the desertic Mediterranean environment. Three primary equine farming systems were identified i) leisure, tourism, and popular games farming; ii) foal commerce farming; and iii) competition and racing farming. Each breeding system reflects different breeding goals, from maintaining cultural traditions to capitalizing on tourism and competitive markets. Despite the constraints of limited land and resources, breeders have developed strategies to ensure the health and productivity of their horses, often relying on external feed sources and advanced breeding techniques

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