

Camel Economy Report



Table of Contents

Executive Summary	5
Introduction	11
Chapter One: Camels and Culture	
Camels in Human History	16
Camels in Arabian Art and Poetry	20
Camels in Saudi Films and Cinema	25
Chapter Two: Camels in Festivals and Cultural Events	
Overview of Camel Festivals and Events	32
Camel Festivals and Events in the Kingdom of Saudi Arabia	36
The Direct Economic Impact of Camel Festivals	41
The Indirect Economic Impact of Camel Festivals	47
The King Abdulaziz Camel Festival	52
Chapter Three: Camel Derivatives	
The Camel Meat Market and Its Economic Impact	66
Camel Milk Derivatives (Industry and Consumption)	71
Camel Fat in Soap, Candle, and Natural Cosmetic Production	74
Camel Fat in Pharmaceutical Manufacturing	76

Chapter Four: Camels in Fashion and Clothing

Camel Fibers and Wool as Alternatives to Traditional Textiles in the Fashion Sector	86
Camel Leather in the Manufacture of Shoes, Bags, Clothing, and Accessories	91
Camel Wool in Carpet and Rug Manufacturing	94

Chapter Five: The Future of Camel Economies

Sustainability in Camel-Related Fields	102
Camel Racing Around the World	106
Virtual Camel Markets and Auctions	108
Challenges and Innovative Solutions Facing the Camel Sector	111

Conclusion	122
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Appendices	124
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Executive Summary

In recognition of 2024 as the "Year of the Camel" and the animal's foundational role in Saudi culture, the Ministry of Culture has prepared this report to analyze the economic significance and strategic opportunities within the Kingdom of Saudi Arabia's camel sector. The report provides a comprehensive overview of the camel's cultural and economic contributions, examines the current landscape, and explores future potential by drawing on both domestic analysis and international experiences.

Camels have been integral to Saudi society for millennia, shaping its cultural, economic, and social identity. This report examines this multifaceted relationship across five key areas: the camel's cultural significance in art, poetry, and cinema; its central role in national festivals and events; the economic value of its derivatives, including meat, milk, and fat; its applications in the fashion and textile industries; and the future of the camel economy, focusing on sustainability, technology, and innovation.



Camels and Culture

Chapter One explores the deep historical connection between humans and camels in the Arabian Peninsula. This enduring cultural bond is traced from ancient rock art—including major discoveries at Jebel Umm Sinman, Jebel Al-Kawkab, and the Hima Cultural Area—to the revered status of camels in classical Arabic poetry, where they symbolize strength, loyalty, and beauty. This legacy continues in contemporary Saudi visual arts and has found a modern voice in cinema. The report analyzes six notable Saudi films produced between 2018 and 2024—*Amra* and the Second Marriage, *Born a King*, *Between the Sands*, *The Valley Road*, *The She-Camel*, and *Hajjan*—where the camel serves as a powerful cultural symbol. The chapter concludes that the camel is vital to the Saudi national identity and that investing in this heritage can drive future cultural and economic development.





Camels in Festivals and Cultural Events

The second chapter provides an overview of major camel festivals in the Kingdom, such as the King Abdulaziz Camel Festival and the Crown Prince Camel Festival, evaluating their developmental impact. These events, which attract global participation, are significant cultural and economic drivers. The report finds that these festivals stimulate substantial economic activity through direct sales and auctions, leading to increased investment in the camel sector. Beyond their economic value, the festivals serve as crucial platforms for exchanging expertise and encouraging innovation in camel breeding. The chapter recommends further studies to optimize investment in the festival sector and its associated services.



Camel Derivatives

Chapter Three analyzes the vital economic sector of camel derivatives. Driven by government support and expanded breeding programs, the Kingdom's camel population grew by an estimated 182.2% between 2019 and 2021. The camel meat sector alone contributes approximately 1-2% of the value added to the national agricultural sector. However, the Kingdom increasingly relies on imports to meet domestic demand. The report also reviews industries based on camel milk and the industrial applications of camel fat in soaps, cosmetics, and pharmaceuticals. It highlights the unique nutritional properties of camel milk and the high value of fatty acids found in camel fat. The report concludes that the Kingdom is an ideal market for natural products derived from camels, presenting a significant opportunity for investment and innovation.





Camels in Fashion and Clothing

The fourth chapter examines the camel sector's promising role in the global fashion industry. It highlights the unique properties of camel wool—including exceptional durability, superior thermal insulation, and biodegradability—as a sustainable alternative to conventional textiles. The report details the potential uses of camel wool and leather in a wide range of products, from luxury apparel and accessories to traditional carpets and rugs. The chapter concludes that leveraging these materials can promote a sustainable national economy, reduce reliance on imports, create employment, and revive traditional handicrafts.



The Future of Camels

The final chapter assesses the future of the camel sector, focusing on the role of modern technology in its advancement. Technologies such as virtual and augmented reality can transform the industry by improving breeding and healthcare, enhancing auctions, and promoting camel racing globally. The chapter also identifies key challenges facing the sector, including infectious diseases, climate change, desertification, weak infrastructure, and a need for modern training for breeders. In response, it proposes innovative solutions, such as developing early warning systems for epidemics, implementing climate adaptation strategies for pasture management, and supporting innovation in supply and marketing chains. The report affirms the Kingdom of Saudi Arabia's potential to lead global research and development in this vital sector.





Introduction

As the Kingdom of Saudi Arabia advances its national strategy to diversify the economy and strengthen non-oil sectors, the camel sector has emerged as an area of immense cultural importance and economic potential. With a registered population exceeding 2.1 million camels and an estimated market value of 50 billion Saudi riyals, this sector represents a vital component of the nation's heritage and a promising frontier for growth. This report provides a comprehensive analysis of the camel's role across various domains, offering a detailed examination of its cultural legacy, its economic impact, and its future prospects in an era of technological innovation.

This report is structured into five chapters, each addressing a distinct facet of the camel economy.

Chapter One delves into the historical and cultural bond between humans and camels in the Arabian Peninsula. It traces the camel's enduring presence from ancient rock art and classical Arabic poetry to its role as a source of inspiration in contemporary visual arts and a powerful symbol in modern Saudi cinema.

Chapter Two examines the landscape of camel festivals and cultural events, both within the Kingdom and internationally. The chapter analyzes the direct and indirect economic impacts of these festivals, highlighting their role in stimulating local markets, boosting tourism, and preserving cultural heritage. It presents the King Abdulaziz Camel Festival as a premier case study of a successful cultural and economic platform.

Chapter Three focuses on the economic contributions of camel derivatives. It analyzes the camel meat market, which accounts for 1-2% of the agricultural sector's value added, and explores the burgeoning industries based on camel milk and fat, including food products, cosmetics, and pharmaceuticals.

Chapter Four investigates the application of camel products in the global fashion industry. It highlights the unique properties of camel wool and leather as sustainable, high-quality materials for clothing, accessories, and textiles. The Kingdom's annual production capacity of approximately 2,800 tons of wool underscores the potential for developing a robust, export-oriented fashion sector based on these resources.

Chapter Five provides a forward-looking perspective on the future of the camel economy. It assesses the role of modern technologies, such as virtual reality and advanced veterinary robotics, in promoting sustainability and improving productivity. The chapter also identifies key challenges—from climate change to market competition—and proposes innovative solutions to ensure the sector's long-term growth and resilience.

Through this detailed analysis, the report aims to illuminate the camel's significance not only as a cornerstone of cultural heritage but also as a dynamic driver of sustainable economic development for the Kingdom of Saudi Arabia.





Camels and Culture





Throughout history, the camel has held a profound place among the inhabitants of the Arabian Peninsula, where it stands as an integral part of Arab heritage and human history. In recognition of this deep cultural and civilizational significance, the Ministry of Culture has designated 2024 as the Year of the Camel. This chapter explores the historical connection between humans and camels in the Arabian Peninsula, a bond forged over thousands of years that continues to shape the region's identity today.

Camels have played a vital role in every aspect of life, serving as essential means of transportation, sources of sustenance, and central figures in communal celebrations. This enduring relationship has fueled artistic and creative expression for centuries, from ancient rock inscriptions to contemporary Saudi art. In this cultural landscape, the camel embodies loyalty, beauty, strength, and endurance. This chapter traces these symbolic representations through an examination of ancient rock art, classical Arabic poetry, contemporary visual arts, and modern Saudi cinema, providing key examples that illustrate the camel's indelible mark on the nation's culture.



Camels in Human History



Camels have played a prominent role in human civilization since ancient times. They are a cornerstone of desert ecosystems and have historically served as indispensable partners to humans. Their unique physical characteristics and functional versatility made them essential for transportation, travel, food, and warfare, particularly in arid environments [1]. As a result, camels became a foundation of economic, social, and military life in many societies [2].

The Historical Development of Camel Domestication

Historians and anthropologists believe camels were domesticated later than other livestock. Evidence suggests sheep were domesticated around 10,000 BCE, followed by cattle approximately 5,000 BCE [2]. The precise period of camel domestication is debated. Some scholars, citing archaeological evidence from Egypt and Mesopotamia, date it to the fourth millennium BCE [3]. Others place it in the late third or early second millennium BCE [4], while another group suggests it occurred during the thirteenth and twelfth centuries BCE [5].

The single-humped camel (*Camelus dromedarius*), known as the Arabian camel, is so named for its origins in the Arabian Peninsula. From the southern part of the peninsula, its range expanded into the deserts of North Africa and the Middle East. Camels were transported along the coasts to Egypt and Sudan, subsequently spreading across North Africa to Libya, Tunisia, and as far west as Mauritania. They also moved from Hadramaut to Somalia via the island of Socotra [6].



Camel Domestication in the Arabian Peninsula

The Arabian Peninsula is widely considered the cradle of camel domestication, from which the practice spread northward to Palestine and Syria. The rise of the camel was closely linked to the flourishing of overland caravan trade routes that crossed the peninsula during the first millennium BCE [25]. A research team from King Faisal University, the University of Nottingham, and the University of Veterinary Medicine in Vienna confirmed through a field study that the initial domestication of the single-humped Arabian camel occurred in the southern part of the Arabian Peninsula [26].

Camel Domestication in North Africa

Camels were known in the Eastern Desert of Egypt during the Old Kingdom period. A camel skeleton dating to the First Dynasty (c. 3200 BCE) was discovered there, along with a camel-shaped vessel from the same period, now housed in the Berlin Museum [6]. However, ancient Egyptians did not widely use camels, possibly for religious and social reasons [6]. Some sources suggest camels were viewed with aversion, associated with the god Set, who represented evil and drought [7]. In other parts of North Africa, such as Tunisia, camel domestication dates to the third century CE, where their use was initially limited to transport [8]. Interest in camels grew with the arrival of Arabs in the seventh century CE and intensified following the migrations of the Banu Hilal and Banu Sulym tribes [9]. Valued for their adaptation to the climate and their ability to thrive with minimal water, camels were used for transport, agriculture, and as a source of milk, meat, and hides. They also became a symbol of wealth and social prestige [10].

Camel Domestication in Central Asia

Camels were integral to the ancient trade routes of Central Asia, connecting East and West. The two-humped Bactrian camel, domesticated in this region, was the primary means of transport across its rugged and arid terrain [25]. For the nomadic peoples of Central Asia, who relied heavily on long-distance trade, owning camels was a point of pride and a symbol of strength and endurance (9, 10).

Camel Domestication in Australia

British settlers introduced camels to Australia in the nineteenth century to aid in the exploration of its vast deserts [11]. Camels quickly proved essential in remote regions, valued for their ability to carry heavy loads, transport goods and mail, and navigate terrain where horses were unsuitable.

Camel Domestication in America

In the 1850s, the United States government imported camels from the Middle East and North Africa for military use in the desert Southwest. While their physiological adaptations proved suitable for the environment, the development of modern transportation and military equipment rendered them obsolete. Many were released into the wild, where they eventually became extinct, unlike in Australia where feral populations continue to thrive [11].

Camel Domestication in Europe

Camel Domestication in Europe

Camels arrived in Europe via ancient trade routes like the Silk Road. However, their use was limited, as the colder climate was ill-suited to their natural adaptations. They were occasionally used by kingdoms and empires for ceremonial displays. Today, camels can be found in tourist attractions in southern Spain and parts of Italy, and they are increasingly the subject of scientific research studying their unique environmental adaptations and health benefits [9].

Uses of Camels

The uses of camels have varied across eras. Their remarkable endurance made them the primary means of long-distance transportation across arid deserts. They were also a strategic military asset, used to transport soldiers, supplies, and equipment, thereby enhancing the combat capabilities of armies and tribes. During the unification of the Kingdom of Saudi Arabia, King Abdulaziz Al Saud relied on camels equipped with light weapons for swift cavalry attacks, providing a strategic advantage in rugged terrain (9, 11, 12).

Camels were the backbone of trade caravans along ancient routes like the Silk Road, transporting valuable goods such as spices, textiles, and perfumes [10]. This trade fostered commercial prosperity and cultural exchange between different civilizations (2, 9). Furthermore, camels were a vital nutritional resource for desert communities. Camel milk, a staple for Bedouins, is rich in essential nutrients and has a longer shelf life than cow's or goat's milk, making it ideal for long journeys [23]. Camel meat is also a primary food source, distinguished by its unique flavor and high nutritional value, and is often consumed during special occasions and celebrations.



Camels in the Culture of the Arabian Peninsula: Between Art and Poetry



The camel holds a unique and revered status in the Arabian Peninsula, where a deep-rooted relationship between humans and camels has evolved over millennia. This connection is profoundly reflected in the region's art and literature, from ancient rock inscriptions and classical Arabic poetry to contemporary visual arts and modern cinema.

The Arabian Peninsula is the ancestral homeland of the camel, and it is here that the greatest genetic diversity of the species is found (11, 12), particularly within the Kingdom of Saudi Arabia [13]. This long-shared history has made the camel an essential part of the region's cultural heritage.

Camels in Rock Art

Studies have documented the presence of camels in the Arabian Peninsula since the tenth millennium BCE [14]. Rock art provides one of the clearest windows into the ancient relationship between the region's inhabitants and camels. These inscriptions and sculptures reveal not only the practical and economic uses of camels but also the deep emotional connection humans felt toward them.

Camel imagery appears in numerous art forms, most notably in sculptures from the Dadanite and Lihyanite civilizations of northwestern Arabia. The Archaeology Museum of King Saud University houses clay statues of camels from this period. The mountains of AlUla are adorned with countless rock inscriptions and artworks depicting camels. In the Hail region, 688 images of camels have been discovered at Jebel Umm Sinman, while in other areas, thousands more have been documented.





Figure 1. Inscriptions at Jebel Al-Mawaqi' – Najran (15)



Figure 2. Thamudic Inscriptions – AlUla Region (17)



Figure 3. Inscriptions at Jebel Arnan – Hail (21)

The transformation of rock faces into magnificent artistic panels testifies to the importance of camels in ancient life. Among the most remarkable examples are the Thamudic inscriptions in the AlUla region, which date back seven thousand years. These artworks symbolize the profound cultural and emotional bond between the people of the Arabian Peninsula and their camels. Other significant sites include Jebel Arnan in Hail and the mountains of Al-Jawf, where a site dating to the Neolithic period (5600-5200 BCE) contains 21 three-dimensional carvings, 17 of which depict camels [16].

Many of these archaeological inscriptions are found along historic trade routes, where camels were essential to the economy. The Hima Cultural Area in Najran, a hub for trade and cultural exchange around 1000 BCE, contains thousands of rock inscriptions and is now a UNESCO World Heritage Site (18, 19, 20). The artists of these pre-Christian eras employed three primary techniques: pecking, grinding, and sculpting, using ancient scripts such as Musnad and Thamudic.

Contemporary Art

The camel's influence on art continues into the present day, where it serves as a powerful source of inspiration in Saudi visual arts. Artists capture the camel's unique features and aesthetics, creating works that blend authenticity with nature and evoke the deep connection between humans and the desert environment [13].



Hurufiyya Art and the Depiction of Camels

The Hurufiyya style, which combines Arabic calligraphy with color, has been used to highlight the aesthetics of camels. The artist Mohammed Al-Harithi, for example, depicted the famous camel Arnoun using this style. Arnoun, considered one of the most valuable camels in the world, is distinguished by physical characteristics like the size of its head and the length of its neck, making it an ideal subject for Al-Harithi's artistic vision.



Color and Composition in the Works of Omar Al-Rashed

The artist Omar Al-Rashed draws inspiration from the beauty of camels, capturing their details in artworks that employ deep colors and dynamic compositions. Using acrylic paints on canvas, he creates vibrant paintings that convey the depth of the human-camel relationship in a distinctive style that merges realism with rich color.



The Grace and Aesthetics of Camels in the Works of Zeina Al-Shahri

Artist Zeina Al-Shahri is known for creating paintings that reflect the grace and beauty of camels. She masterfully captures intricate details such as the hanging sabal (the hair on a camel's neck), the length of the neck, and the size of the head. One of her most notable works is a painting of the she-camel Al-Dhayir, which won the "Jewel of the Desert" prize at the 2023 King Abdulaziz Camel Festival.



Camels in Photography

Photography has also played a role in documenting the unique relationship between humans and camels. The photographer Majdi Al-Nasser, for example, has captured distinctive moments that reveal the mutual understanding and serenity shared between humans and camels, preserving this historic bond in the collective memory.



Camels in Poetry

In Arabic literature, the she-camel (naqa) has long been an authentic Arab symbol of wealth, strength, generosity, and chivalry. As Aktham ibn Sayfi Al-Tamimi wrote in his will to the Tayy tribe: "Do not place the necks of camels except where they are deserved, for in them lies the price of the noble steed (dowry), the payment of blood money (diya), their milk is an offering to the distinguished, and a nourishment to the young."

The depiction of camels is abundant in Arabic poetry, particularly from the pre-Islamic era, where they are often portrayed as beloved companions. The poet 'Ubayd ibn al-Abras al-Asadi said: "And my companion is a sturdy, beloved one, whom I set forth with at dawn, hastening."

**"I crossed it at early dawn, turning away resolutely,
while my companion (the camel) was stout/fat, yet a swift trotter."**

This portrayal of the camel as a partner in facing life's challenges indicates its esteemed status. The poet Tarafa ibn al-'Abd offered one of the most vivid descriptions of a camel in his Mu'allaga, celebrating its physical harmony and beauty in such detail that the animal becomes the central subject of the ode:

**"Indeed, I dispel my sorrows at their peak
With a swift, tall she-camel that gleams and strides away.**

**Of strong build, like planks of well-smoothed wood,
I have raised her over a smooth, wide plain like the back of a woven carpet.**

**Majestic and sturdy, she moves gracefully,
Like a well-carved, powerful spear for a valiant warrior.**

**She races alongside noble, swift camels, overtaking them
Stride after stride, over a well-trodden, paved path.**

**She grazes lightly with the trailing herd,
In the gardens of a master with flowing hair and noble lineage.**

**Alert to the voice of the herder, cautious and wary,
With thick tufts of hair shielding her from the sudden frights of the dappled skies."**

In this powerful depiction, the camel is a loyal supporter whose companionship alleviates worries. Pre-Islamic poetry reveals that camels were more than just a source of food; they were also regarded as valuable financial and economic assets. Some poets, like al-A'sha Qays, even referred to camels simply as "wealth" (māl).

**The last time I remembered him, he was grazing the finest
pastures with the camel (his wealth).**



Camels in Saudi Films and Cinema



As an extension of the camel's cultural legacy, the animal has a notable presence in modern Saudi cinema, where it serves as a cultural symbol with profound meaning. This presence is particularly significant as the Saudi film industry seeks to reflect the close ties between local culture and filmmaking, promoting national identity and highlighting heritage in its storytelling. Since the reopening of cinemas in Saudi Arabia in April 2018, camels have appeared in at least six films: *Amra and the Second Marriage* (2018), *Born a King* (2019), *Between the Sands* (2022), *The Valley Road* (2023), *The She-Camel* (2023), and *Hajjan* (2023).



Figure 4. Actor (Matar), Star of the Film *Hajjan*, Preparing for the Race on His Favorite She-Camel (Hafeera)

An analysis of these films reveals three distinct contexts for the camel's appearance. In *Hajjan*, the camel is the essence of the story; the plot, dramatic structure, and progression of events are all built within the world of camel racing. In *Between the Sands* and *Born a King*, camels appear as part of the visual background, integrated into the daily lives and environment of the characters. In *The She-Camel*, the camel functions as a secondary narrative element that serves to advance the plot.

The film *Hajjan* is notable for blending poetry and camels within a cinematic framework. It tells the story of a boy named Matar who discovers his passion for camels through racing and life in the desert. The film opens with poetic verses celebrating the deep connection between a rider and his camel:

"O muse, with the sweetest melodies,
Carry the tune and let it flow.
Camels are the beloved of the camel rider,
And only those attached to them truly know."

Hajjan can be approached from three perspectives: the financial investment of the owners, the chivalry and skill of the riders, and the loyalty and strength of the camels themselves.



In the film *Born a King*, the camel's presence is secondary but carries profound symbolism. It is used to convey the camel's role in both war and celebration. In a flashback scene depicting the 1906 war against the Ottomans, camels are shown alongside horses as a vital part of military strength. Later in the film, when King Faisal returns from the United Kingdom after securing British recognition of King Abdulaziz as the Emir of Najd, camels are featured in the celebrations, alongside the Saudi Ardah performance, as symbols of pride and honor.

The enduring presence of the camel in Saudi culture—from ancient history to modern cinema—is a testament to its profound symbolic and cultural significance. No matter how much lifestyles and economies evolve, the camel will continue to be a vital part of the Saudi identity, past, present, and future.



Figure 5. Actor Abdullah Ali Portraying "King Faisal bin Abdulaziz" in the Film *Born a King*

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Camels in Festivals and Cultural Events





Camel festivals are powerful platforms for celebrating and preserving national heritage. These events, which feature a wide range of cultural and competitive activities, generate significant direct and indirect economic returns while safeguarding timeless traditions. This chapter provides an overview of international camel festivals, analyzes the landscape of festivals within the Kingdom of Saudi Arabia, and examines their direct and indirect economic impacts. It focuses on how these events stimulate local markets, increase investment in camel-related sectors, and support cultural tourism.

Furthermore, this chapter presents a detailed historical overview of the King Abdulaziz Camel Festival, the world's largest event of its kind, as a model for cultural and economic development. By leveraging its rich heritage, government support, and modern infrastructure, the Kingdom is well-positioned to enhance its status as a global center for premier camel-focused events and achieve greater popularity at both regional and international levels.



A Look at Camel Festivals and Events Around the World



Camels in Festivals and Cultural Events

An exploration of camel festivals worldwide reveals the significant role these events play in promoting camel culture and strengthening national economies. While the approaches to organizing these events vary, they commonly feature camel races, beauty contests (Mazayna), and heritage exhibitions that celebrate cultural traditions. The Kingdom hosts the world's largest event, the King Abdulaziz Camel Festival, while other major festivals include the Al Dhafra Festival in the United Arab Emirates and the Tan-Tan Moussem in Morocco. Other nations, including Oman, Qatar, Kuwait, Egypt, India, and Australia, also host significant camel-related cultural events.



King Abdulaziz
Camel Festival



Tan-Tan Season



Al Dhafra Camel Festival



Heraa' Shields for Camels
and Heritage Festival



Elite Camel
Mazayna Festival



Pushkar Annual
Camel Fair



Qatar Camel Festival
(Jazilat Al-Ata)



Tara Annual Festival for
Culture and Camel Racing



Sharm El-Sheikh International
Camel Racing Festival



Maralal Camel Racing
Festival



Jordan Camel Racing
and Nabati Poetry Festival

United Arab Emirates

The UAE has a significant camel population, estimated at approximately 450,000 head, and a thriving camel racing culture with over fifteen professional tracks [1]. The annual Al Dhafra Camel Festival in Abu Dhabi is one of its most prominent events, featuring 90 rounds of competition and employing modern technologies like robotic jockeys, GPS tracking, and aerial cameras to enhance the spectator experience [2]. Other major events include the Al Marmoom Heritage Festival in Dubai and the His Highness Sheikh Mohammed bin Zayed Al Nahyan Festival for Purebred Arabian Camel Racing and Camel Beauty in Ajman [3].

Arab Republic of Egypt

In Egypt, where the camel population reached approximately 180,000 head in 2023, camel racing is a sport overseen by the Ministry of Youth and Sports [4]. The Sharm El-Sheikh International Camel Racing Festival attracts participants from 12 Arab and international countries [5]. Other notable events include the Sharqia Camel Festival and the Alamein Festival, which was the first in Egypt to feature a camel milking competition.

Kingdom of Morocco

Morocco's camel population totals approximately 183,000 head [6]. The country's most important camel-related event is the annual Tan-Tan Moussem, which celebrates the historical and economic role of camels in the region. In 2008, UNESCO recognized the Tan-Tan Moussem as part of the Intangible Cultural Heritage of Humanity [3].

Sultanate of Oman

Oman has a camel population of approximately 290,000 head [7]. Prominent festivals include the Khareef Dhofar Festival, which features 21 racing rounds with participation from across the GCC, and the Hamra Al-Duru' Camel and Traditional Heritage Festival, which aims to promote camel sports.

Qatar

Qatar's camel population was approximately 136,500 head as of 2019 [8]. The state organizes several festivals, most notably the annual Qatar Camel Festival "Jazilat Al-Ata," which focuses on camel beauty contests (Mazayna) to support owners and promote camel breeding internationally. Other events include the Al-Tahadi Festival and the Al-Wajba Camel Festival [8].

Kuwait

Kuwait's camel population exceeds 170,000 head [9]. Its most important heritage event is the Elite Camel Festival, which is dedicated to showcasing the traditions of camel breeding in the region [11].

Hashemite Kingdom of Jordan

Jordan, with a camel population of approximately 14,000 head, hosts the Jordan Camel Racing Festival in Wadi Rum [12]. This event recently held the country's first-ever camel beauty contest.

India

India organizes the Pushkar Annual Camel Fair in Rajasthan, considered one of the largest camel fairs in the world. Officially organized by the government to promote tourism, the event attracts thousands of visitors from around the globe [15].

Australia

Australia hosts numerous festivals that blend cultural and sporting elements. These include the Tara Festival of Culture and Camel Races in Queensland, the Outback Camel Festival Trail, and the annual Camel Cup in Central Australia, all of which celebrate the camel's role in Australian heritage (16, 17, 18).

Kenya

Kenya ranks fourth globally in camel population with approximately 4.6 million head. The Maralal International Camel Derby, held in northern Kenya, is a major international event that attracts participants from across East Africa and beyond, blending traditional racing with modern sporting elements [19].

Camel Festivals and Events in the Kingdom of Saudi Arabia



The Kingdom of Saudi Arabia hosts a variety of camel festivals that serve as vital platforms for regional development. These festivals attract camel owners and enthusiasts from across the Kingdom, the GCC, and the world to participate in events ranging from camel beauty contests (Mazayna) and races to auctions and cultural exhibitions. These activities, which include poetry evenings, traditional performances, and educational seminars, highlight the importance of the camel in Saudi heritage (27, 22, 36, 37, 39).

The King Abdulaziz Camel Festival, organized by the Camel Club, is the largest of its kind in the world. Held at the Al-Syahd Grounds northeast of Riyadh, its eighth edition featured over 21 activities, including beauty contests, races, heritage museums, and the inaugural Princess Noura bint Abdulrahman Race, reflecting a growing focus on empowering women in cultural events (23, 28, 36, 37, 38).

The Crown Prince Camel Racing Festival, held annually in Taif since 2018, aims to preserve the heritage of camel racing in Saudi and Arab culture. With prizes increasing from 45 million riyals in its first edition to 56 million riyals in 2024, the festival has grown into a major international event featuring races, a camel museum, a traditional market, and live performances [27].

The King Salman Camel Racing Festival, launched in Riyadh in 2024, featured 224 rounds of competition with a total prize value exceeding 70 million riyals. This festival aims to preserve and develop the sport of camel racing, contribute to economic development, and enhance the Kingdom's global position in traditional sports [39].

The Jaddat Al-Ibil Festival, a traveling event held in regions such as Tabuk, Hail, and Taif, is designed to stimulate local economies, expand the market for camel-related activities, and boost regional trade and commerce (24, 43).

Together, these festivals demonstrate the evolution of cultural traditions into a thriving industry that contributes to the development of multiple sectors across the Kingdom and the broader Arab world.

Analysis of the Reality of Camel Festivals and Events in the Kingdom

This section analyzes the history, scope, and nature of the primary camel festivals and events in the Kingdom.

History of Camel Festivals and Events in the Kingdom

Table No. [1] illustrates the history of major camel festivals in the Kingdom, detailing their location, organizers, prize values, and objectives. The data reveals a significant expansion in recent years; with the establishment of the Jaddat Al-Ibil Festival in 2023 and the King Salman Camel Racing Festival in 2024, the total number of major national festivals has doubled from two to four.

Table No. 1: Camel Festivals and Events in the Kingdom

<div><div></div><div>Crown Prince Camel Racing Festival</div></div> <div><div></div><div>Saudi Camel Racing Federation</div></div> <div><div></div><div>Taif</div></div> <div><div></div><div>2018</div></div> <div><div></div><div>56,000,000 sr</div></div> <div><div></div><div>Annual</div></div> <div><div></div><div>promote camel racing heritage in Saudi culture, emphasizing national values, cultural and economic benefits, and reflecting the Kingdom's cultural depth.</div></div> <div><div></div><div><div>➤ Camel Racing Competitions</div><div>➤ Camel Museum</div><div>➤ Theater</div><div>➤ Circus</div><div>➤ Traditional Market</div><div>➤ Camel Gifts Store</div><div>➤ Camel Tent</div><div>➤ Children's Games</div><div>➤ Roaming Performances</div><div>➤ Live Performances</div></div></div>	<div><div></div><div>King Abdulaziz Camel Festival</div></div> <div><div></div><div>Camel Club</div></div> <div><div></div><div>Ramah Riyadh</div></div> <div><div></div><div>2000</div></div> <div><div></div><div>300,000,000 sr</div></div> <div><div></div><div>Annual</div></div> <div><div></div><div>To reinforce national culture and heritage, foster interaction between leadership and the public, enhance national belonging, promote national development while preserving heritage.</div></div> <div><div></div><div><div>➤ King Abdulaziz Camel Beauty</div><div>➤ Contesto King Abdulaziz Camel Racing Awards</div><div>➤ Saudi Traditional Dance Performance (Ardah)</div><div>➤ King Abdulaziz Popular Literature</div><div>➤ Awards National</div><div>➤ History Olympics</div><div>➤ Panoramic Dome</div><div>➤ Senem Exhibition</div><div>➤ Tasili Tenta Hawir</div><div>➤ Theatero Sand Art and Camel Decorative</div><div>➤ Paintingo Best Camel Photo</div><div>➤ Contesto Traditional Market</div><div>➤ Entertainment Campo Camel</div><div>➤ Branding Contest</div><div>➤ Al-Dhannah Market and Al-Syohd Trail</div><div>➤ International Camel Forum</div><div>➤ Social Responsibility Initiatives</div></div></div>
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Camels in Festivals and Cultural Events



Jaddat Al-Ibil Festival

Camel Club Multiple Locations 2023

Diversified by region Annual

To highlight and preserve Saudi heritage related to camels in the Kingdom.

- Camel Competitions
- Camel Beauty Contest
- Handcrafted Cultural Industries
- Camel Branding
- Open Theater Events
- Camel Dance (Sultani Riders)
- Sand Sculpting
- Mataaya Exhibition
- Azza for Its People Exhibition
- Falcon Tent
- Hospitality Tent
- Traditional Market
- Traditional Pickup Trucks



King Salman Camel Racing Festival

Saudi Camel Racing Federation Jeddah Riyadh 2024

70,000,000 SR Annual

To develop the historic camel racing sport, preserve its cultural and athletic significance for future generations, and make camel racing a national sport with global aspirations.

- Camel Riders' Race for Men (5 km)
- Camel Riders' Race for Women (2 km)

Examples of festival activities, which may not be fixed for every edition of the festival.

Nature of Camel Festivals and Events in the Kingdom of Saudi Arabia

The environmental analysis of the Kingdom's camel festivals, presented in Appendix [1], details the strengths, weaknesses, opportunities, and challenges associated with these events. As Table No. 2 highlights, the Kingdom's festivals have achieved regional and global significance, reflecting the nation's substantial investment in developing the camel sector.

Table No. 2: Analysis of the Nature of Camel Festivals and Events in the Kingdom of Saudi Arabia



The King Abdulaziz Camel Festival attracts top camel owners from Saudi Arabia, the Gulf, and international countries like the USA, Russia, and France, making it a key driver of camel sales locally and globally. Similarly, the inaugural King Salman Camel Racing Festival in 2024 demonstrated its international scope with participants from seven countries and a special women's race featuring riders from nine nations.



Direct Economic Impact of Camel Festivals



The direct economic impact of camel festivals is primarily driven by the stimulation of commercial activity. This includes direct transactions, high-value auctions, and substantial competition prizes, all of which motivate owners and investors to participate in the market and invest in developing camel breeds. This, in turn, increases the market value of camels and enhances overall financial activity in the sector.

Buying and Selling Transactions During Camel Festivals

Camel festivals function as vibrant marketplaces where the finest camel breeds are displayed and high-value commercial transactions are conducted. These events play a crucial role in revitalizing local and regional camel markets by increasing demand, raising prices, and promoting the quality of Saudi camels on the international stage. The King Abdulaziz Camel Festival, for instance, hosts one of the largest camel markets in the Gulf region, with financial transactions increasing significantly each year. During its fifth edition in 2020, prices for top-tier camels saw a dramatic rise, with some she-camels selling for over 3 million riyals [23]. At the eighth edition in 2023, auctions recorded sales totaling 62 million riyals, while the previous edition's sales exceeded 380 million riyals [24].

Other regional festivals have also yielded significant economic returns. The Jaddat Al-Ibil Festival in Taif generated over 30 million riyals, with more than 250 sale and purchase transactions daily and a total camel sales value surpassing 6 million riyals [25]. Similarly, auctions in Turba (Hail), Tabuk, and Najran have seen transactions valued in the hundreds of thousands to millions of riyals, indicating robust investment opportunities and a positive impact on regional economies (26, 27, 40).

Camel Festival Competition Prizes

The substantial prizes offered at camel festivals are a key driver of their economic impact. These prizes incentivize owners to invest in improving their breeds' health, nutrition, and training, which contributes to increasing their market value and boosting financial transactions. Competitions range from Mazayna (beauty contests) to races and other traditional contests, with winners receiving substantial monetary awards—sometimes reaching millions of riyals—and valuable in-kind prizes like luxury cars.

The Jaddat Al-Ibil Festival in Taif, for example, offers prize pools totaling over 15 million riyals across its various competition categories [41]. As shown in Figure No. [1], the prize value for the Crown Prince Camel Racing Festival grew by 26.67% between its first edition in 2018 (45 million riyals) and its fifth edition in 2023 (57 million riyals), demonstrating a clear trend of increasing investment.

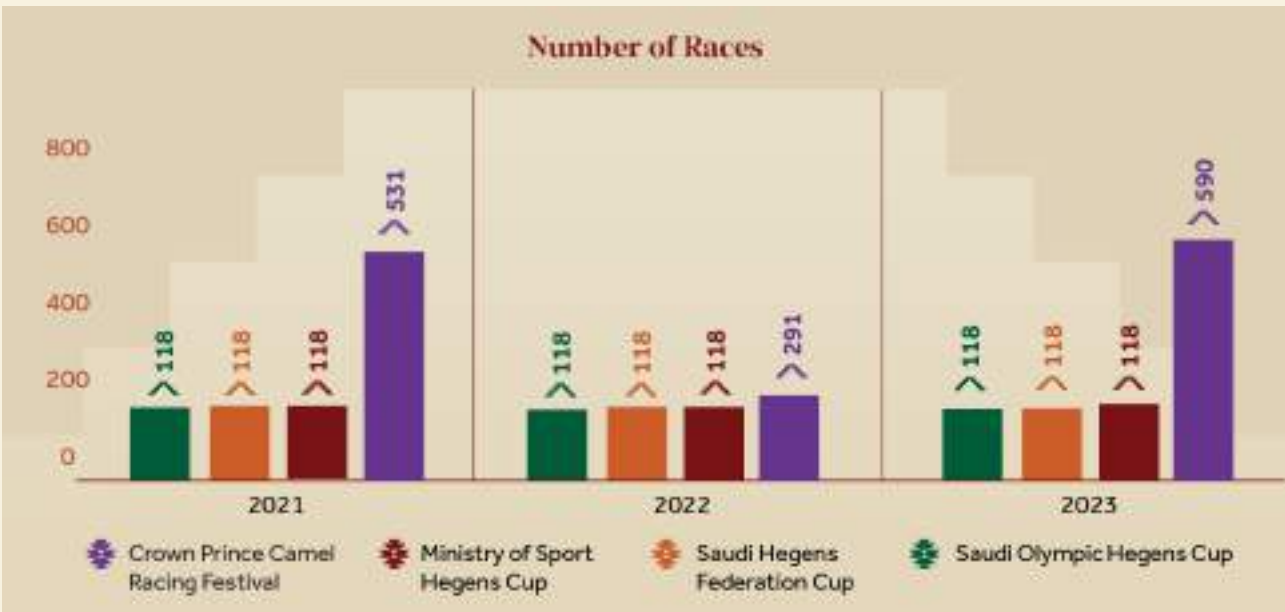
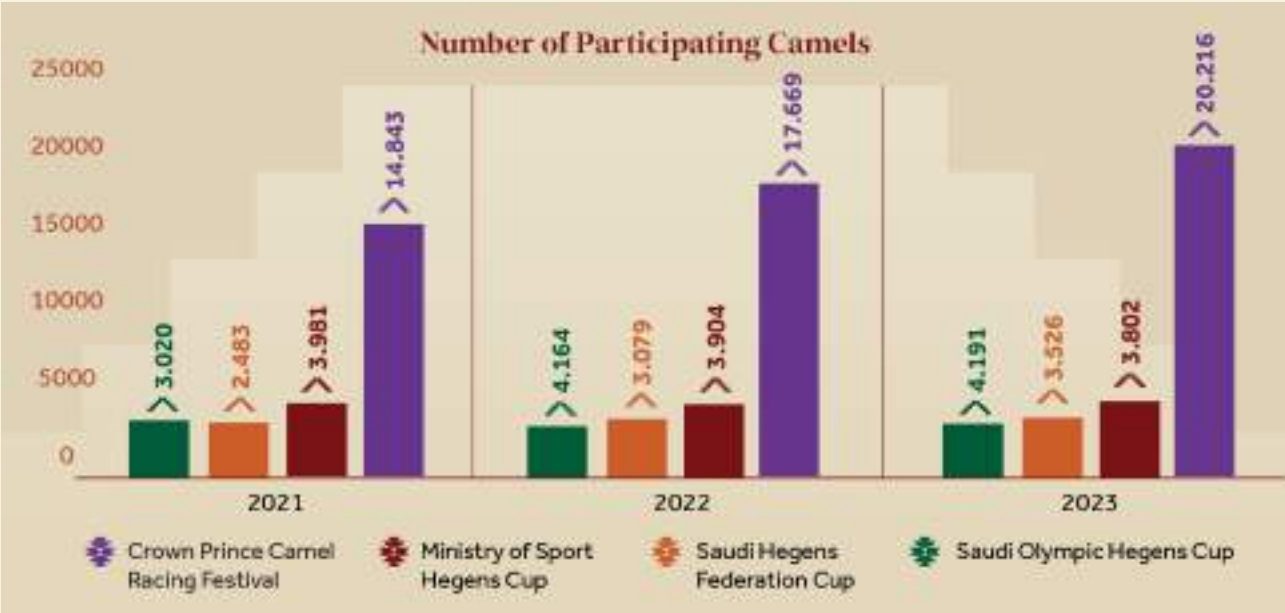




Figure No. (1): Prize Values (in Million Riyals) for the Crown Prince Camel Racing Festival (27).

These prizes directly motivate owners to enhance their herds, creating a ripple effect that generates indirect economic activity. Investments in training facilities, specialized feed, and veterinary care create job opportunities and support ancillary sectors related to camel breeding. The introduction of an International Women's Marathon at the 2023 Crown Prince Camel Racing Festival, with a prize pool of 155,000 riyals, highlights how these prizes can also drive social progress by empowering women and encouraging their participation in cultural events [29].

Camels in Festivals and Cultural Events



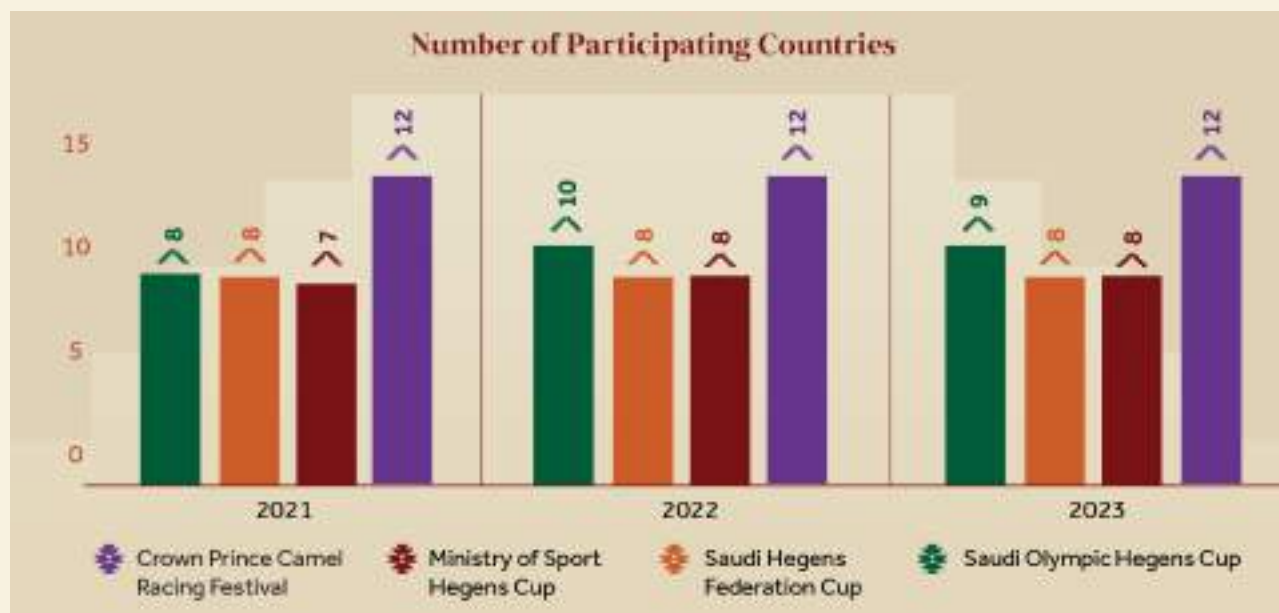


Figure No. (2): Data Related to Camel Racing Activities in the Kingdom of Saudi Arabia

Supply and Demand in the Camel Market

Camel festivals act as a major catalyst for the camel market, stimulating both supply and demand. During festival periods, demand for rare and distinguished breeds intensifies, attracting breeders from across the Kingdom and enriching the market with a greater diversity of camels. This heightened activity extends to camel products like milk and meat, which see increased consumer interest.

The value of festival prize money directly influences the prices of participating camels. Auctions held during these events consistently record record-breaking sales figures, reflecting the market's vitality. At the Elite Auction during the fourth edition of the King Abdulaziz Camel Festival, several transactions exceeded 2 million riyals, with one camel reaching a price of 2.1 million riyals (30-32). At the third edition, an Ash'al Male Camel was sold for a record 5.2 million riyals [38]. These figures underscore the profound impact of camel festivals on the camel market and their role in enhancing the Kingdom's position as a leader in this sector, both locally and globally.

Indirect Economic Impact of Camel Festivals



Beyond direct sales and prizes, camel festivals generate significant indirect economic impacts across various sectors. The increased demand for goods and services associated with camel breeding—such as feed, medicine, and transportation—stimulates production and creates new job opportunities in fields like veterinary care and logistics. Furthermore, these festivals are a cornerstone of cultural tourism, a rapidly growing segment of the global travel industry that combines heritage preservation with economic development (33-34).

With over 1.8 million camels in the Kingdom owned by more than 80,000 individuals, the camel sector is a vital part of the national economy and a key repository of cultural heritage [35]. This section analyzes the indirect economic impact of camel festivals by focusing on their role in stimulating local markets, increasing investment, boosting local labor market indicators, and supporting cultural tourism. This analysis aligns with the objectives of Saudi Vision 2030, which seeks to diversify the economy by transforming cultural events into economic drivers that enhance the participation of local sectors.

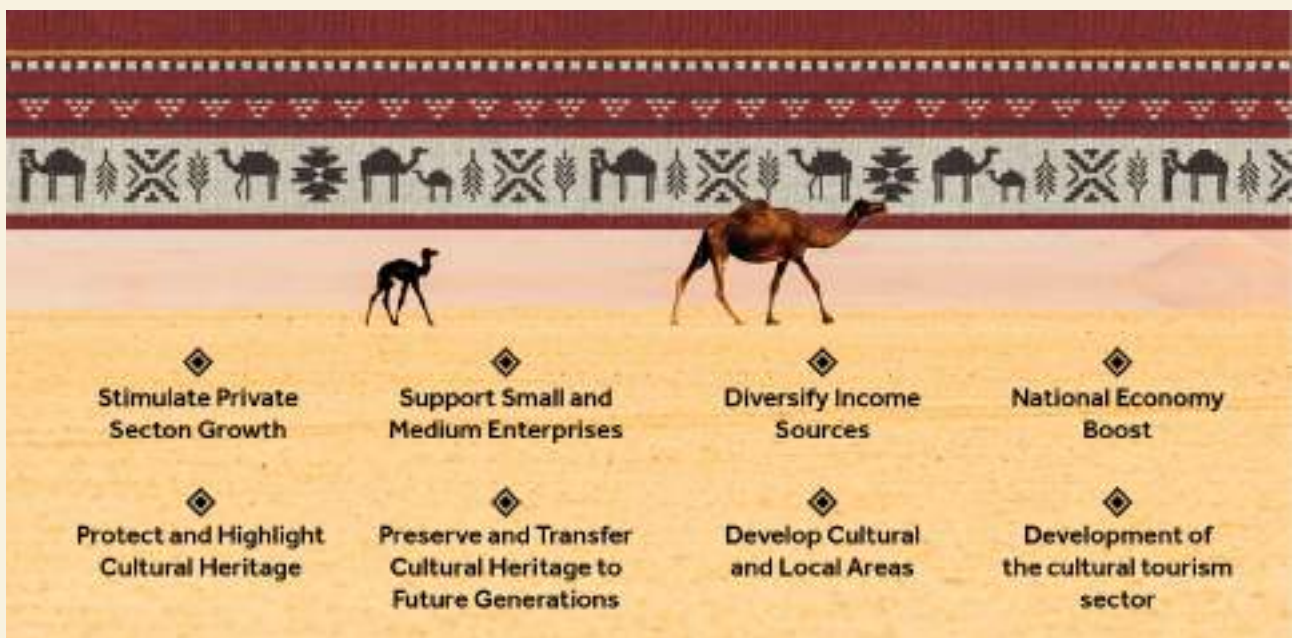


Figure No. (3): Some Aspects of the Link Between Camel Festivals Objectives and Saudi Vision 2030

To evaluate these indirect impacts, a survey was conducted at the Jaddat Al-Ibil Festival in Taif in September 2024, targeting a group of 43 investors, owners, organizers, and visitors. The survey relied on a descriptive analytical approach to measure three key areas: the increased demand for goods and services, the impact on the local labor market, and the contribution to tourism.

Analysis of the Results for the Relative Importance Ranking of Key Areas

As shown in Table No. [3], which ranks the survey areas based on their mean values, the most significant indirect economic impact of camel festivals is the increased demand for goods and services. The improvement of labor market indicators and the enhancement of tourism also received high average ratings, confirming that festivals have a multifaceted positive impact on the local economy.

Ranking	Key Areas	Average Rating (Out of 5)
1	The camel festival contributes to increasing demand for goods and services.	4.6
2	The camel festival contributes to improving labor market indicators.	4.5
3	The camel festival contributes to enhancing tourism.	4.5

Table No. (3): Ranking of the Key Areas Measuring the Indirect Economic Impact

Impact of Camel Festivals on the Demand for Goods and Services

Table No. [4] shows that among the elements related to the demand for goods and services, the increased demand for transportation services and equipment ranked highest among survey participants. This was followed closely by the increased demand for hospitality and accommodation services. The demand for feed and camel supplies, while still significant, was ranked as the least important of the three elements.

Ranking	Key Areas	Average Rating (Out of 5)
1	Increased demand for transportation services and equipment.	4.8
2	Increased demand for hospitality and accommodation services during the camel festival period.	4.7
3	Increased demand for feed and camel supplies.	4.3

Table No. (4): Ranking of the Elements of the First Area (Demand for Goods and Services)



Impact of Camel Festivals on Labor Market Indicators

As summarized in Table No. [5], survey participants identified the development of skills specific to the camel sector and the enhancement of business efficiency as the most important labor market impacts. The improvement of local incomes and the creation of new job opportunities, while still rated highly, were considered slightly less impactful, suggesting that while festivals are culturally significant, their direct contribution to income growth and job creation may be more limited compared to their role in skill development.

Ranking	Key Areas	Average Rating (Out of 5)
1	The camel festival contributes to developing skills specific to the camel sector.	4.6
2	The camel festival contributes to enhancing the efficiency of businesses in the camel sector.	4.6
3	The camel festival contributes to improving local incomes.	4.4
4	The camel festival contributes to creating job opportunities.	4.4

Table No. (5): Ranking of the Elements of the Second Area (Labor Market)

Impact of Camel Festivals on the Tourism Sector

Table No. [6] ranks the elements related to tourism. The results show that the overall contribution of festivals to boosting tourism during the event period was ranked as the most important element. Camel races and heritage markets were identified as the most attractive events for tourists, while artistic performances and family activities were ranked lower. This suggests that the unique cultural experiences specific to camel festivals are the primary draw for both local and international visitors.

Ranking	Key Areas	Average Rating (Out of 5)
1	Camel festivals contribute to boosting tourism during the festival period.	4.7
2	Camel races are among the most tourist-attractive events during the camel festival period.	4.6
3	Promoting camel festivals internationally enhances tourism in the Kingdom.	4.6
4	Heritage markets and exhibitions are among the most tourist-attractive events during the camel festival period.	4.4
5	Artistic and poetic performances are among the most tourist-attractive events during the camel festival period.	4.4
6	Entertainment and family activities are among the most tourist-attractive events during the camel festival period.	4.2

Table No. (6): Ranking of the Elements of the Third Area (Tourism)



King Abdulaziz Camel Festival



The King Abdulaziz Camel Festival, the largest and most prominent event of its kind, has evolved significantly since its inception. The idea was first proposed in 2000 with the support of Prince Mishaal bin Abdulaziz. In 2018, a royal decree established the Camel Club, which became responsible for organizing the festival. The event has since grown in scale, participation, and prize offerings, attracting thousands of visitors and participants from around the world. The prize value for the festival has steadily increased, rising to 250 million riyals for the sixth edition in 2021 and 300 million riyals for the seventh edition in 2022, making it the most valuable competition of its kind globally (44, 45). The eighth edition in 2023 was held under the slogan "Honor for its People," with a focus on sustainable development and strategic partnerships.

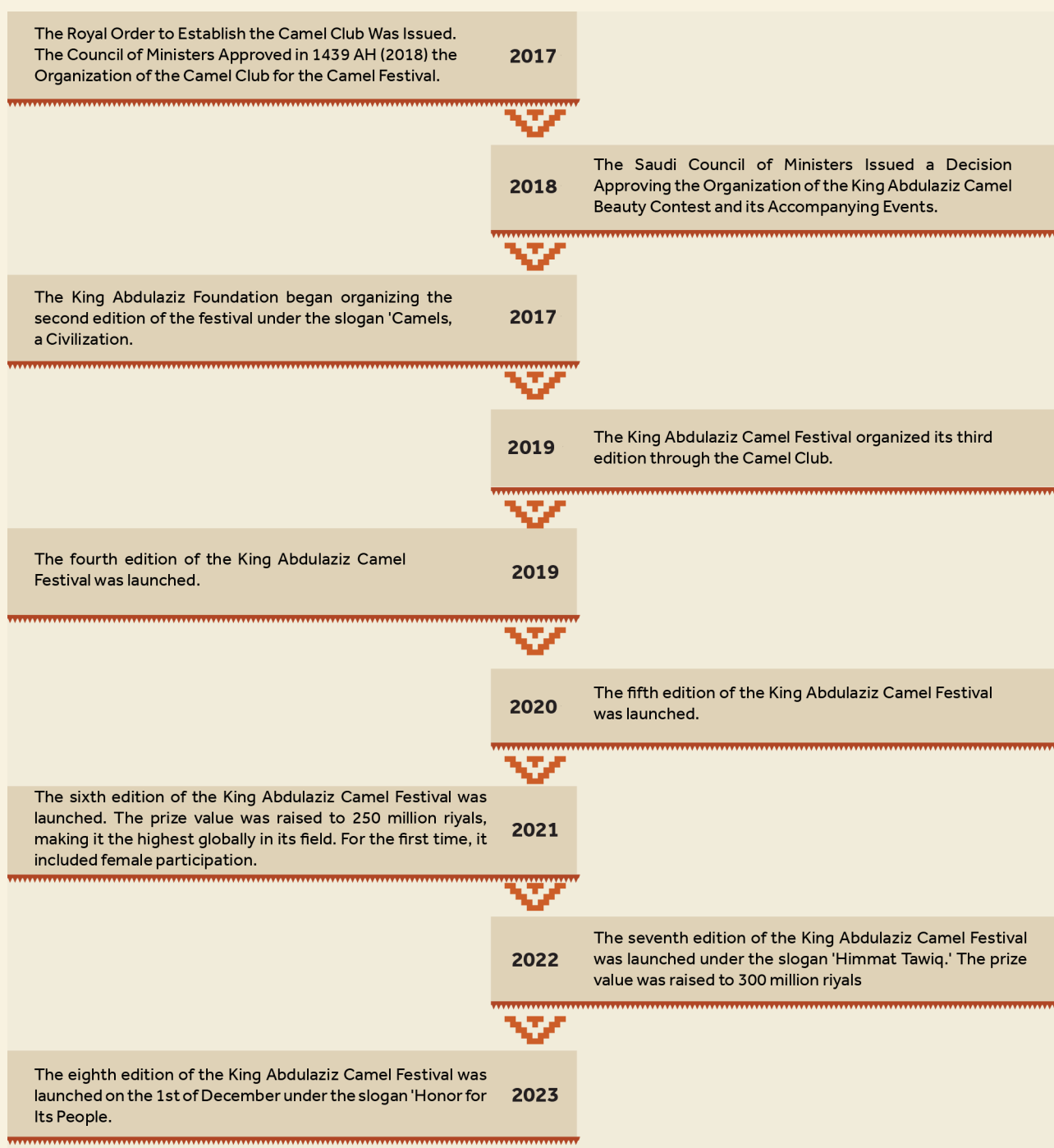


Figure (4): The Historical Development of the King Abdulaziz Camel Festival



Vision and Objectives

The festival's vision is to be the world's premier camel competition, serving as a leading tourist, cultural, heritage, and recreational destination. Its objectives include:

Enhancing the appeal of the festival and the camel sector to all segments of society and attracting more international tourists.

Boosting revenues and diversifying investment opportunities to enhance sustainability.

Developing the festival site's infrastructure to create a permanent desert tourism destination.

Designing innovative, high-quality events that enrich the visitor experience.

Location of the Festival

The festival is held in the southern dunes of the Dahna Desert, 140 km northeast of Riyadh. This location was chosen for its historical significance as a meeting point for ancient caravan routes and a gathering place for the armies of the founding king, Abdulaziz Al Saud. The vast, flat terrain is also ideally suited for camels.

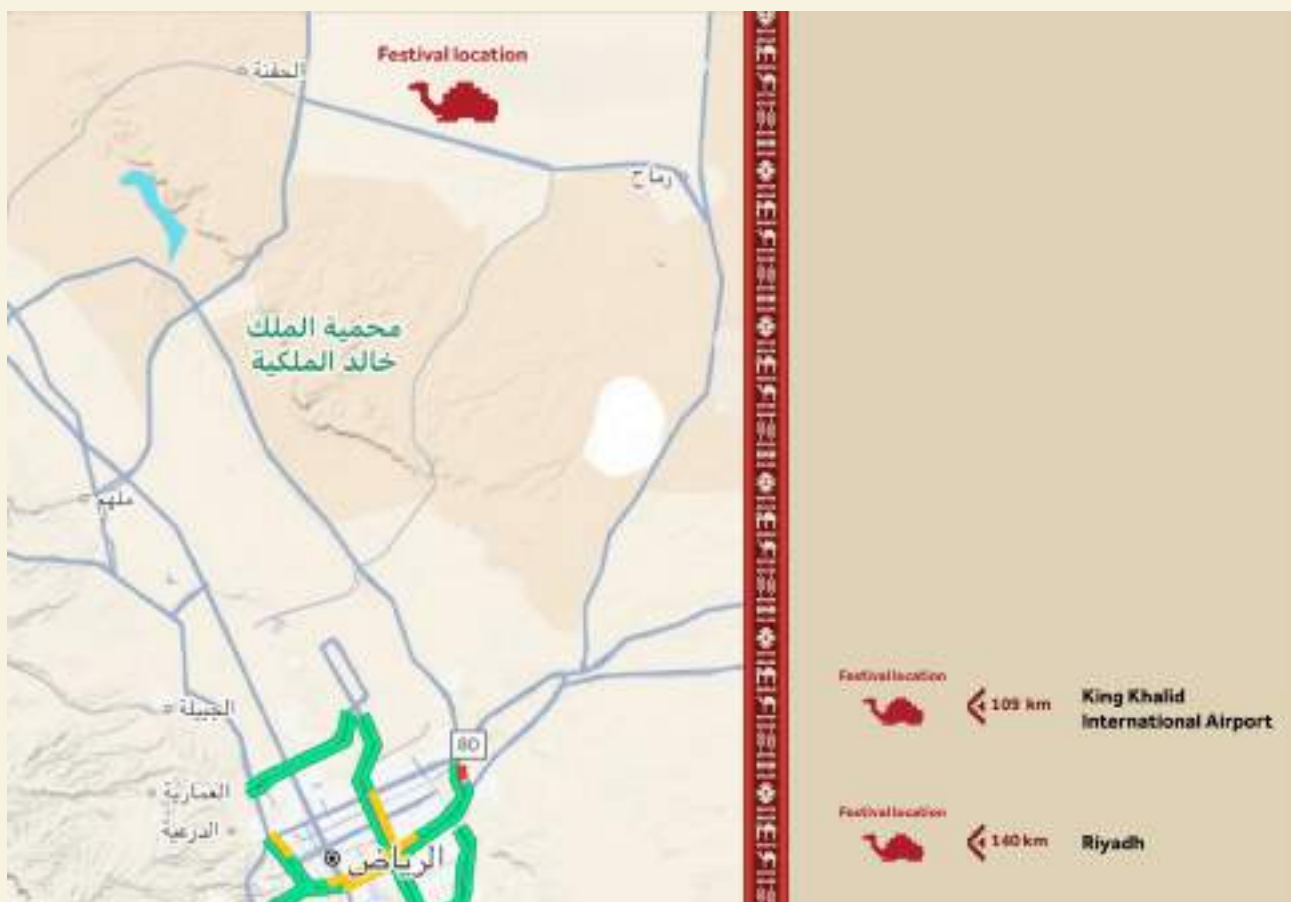


Figure (5): Map of the location and its coordinates (36)

The Saudi Camel Village

The festival site, named "The Saudi Camel Village," was designed to the highest international standards, covering an area of 30 million square meters. The village is divided into four sections: the Mazyin Field for competitions, a section for camps and complexes, a commercial street called "Dahna Street," and a village center with a desert park for entertainment and cultural activities [47]. The architectural style reflects the region's desert culture while incorporating modern infrastructure and a commitment to environmental preservation.



Figure (6): The Saudi Camel Village (37)



Festival Competitions

The festival includes a range of competitions and challenges, including camel beauty, camel racing, a milking contest, and a branding contest, in addition to a large camel market and auctions.



Figure (7): Festival Competitions, Camel Market, and Auctions (37)

Expected International Impact

The King Abdulaziz Camel Festival is expected to have a significant international impact. It serves as a platform for promoting Saudi culture globally, attracting thousands of international tourists, and fostering cultural exchange between breeders, experts, and researchers from around the world. The festival also promotes innovation in the camel industry by showcasing new techniques in breeding, care, and training. As a tool of cultural diplomacy, the event projects a positive image of the Kingdom as a nation that preserves its rich heritage while embracing modernity.

In conclusion, camel festivals in the Kingdom of Saudi Arabia have become a bridge connecting heritage, culture, and tourism. By continuing to develop the visitor experience and invest in these events, the Kingdom can ensure their long-term success and solidify its position as a global leader in the camel sector.



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Camel Derivatives





Camels are a vital source of numerous food and industrial products that contribute directly to local and international economies. Camel meat is a traditional and culturally significant food source, while camel milk and its derivatives offer unique nutritional and health benefits. This chapter highlights the economic role of these products by analyzing the camel meat market, examining the industries based on camel milk derivatives, and exploring the industrial uses of camel fat in cosmetics and pharmaceuticals.

Drawing on economic data, market reports, and case studies, this chapter provides an integrated analysis of the economic and cultural value of camel derivatives. The findings indicate that while the camel sector is growing—with the camel population increasing by 18.2% between 2019 and 2021 and the meat sector contributing 1-2% of the agricultural sector's added value—the Kingdom still relies on imports to meet rising local demand. This points to significant opportunities for domestic growth, innovation, and investment in this promising sector.



Camel meat market and its economic impact



Camel meat and milk are valuable sources of nutrition. Camel milk contains low levels of cholesterol and is rich in minerals and vitamins, while camel meat is distinguished by its low fat content and high concentration of essential minerals (2, 49). The importance of camels as a food source has grown significantly in recent years, contributing to the Kingdom's food security, particularly in the face of climate change.

According to the Arab Organization for Agricultural Development, Saudi Arabia is the fourth-largest country in camel farming, following Somalia, Sudan, and Mauritania. As Figure [1] illustrates, the Kingdom's camel population grew from nearly half a million in 2019 to approximately 1.4 million in 2021, accounting for 7.7% of the total camel population in Arab countries [3].

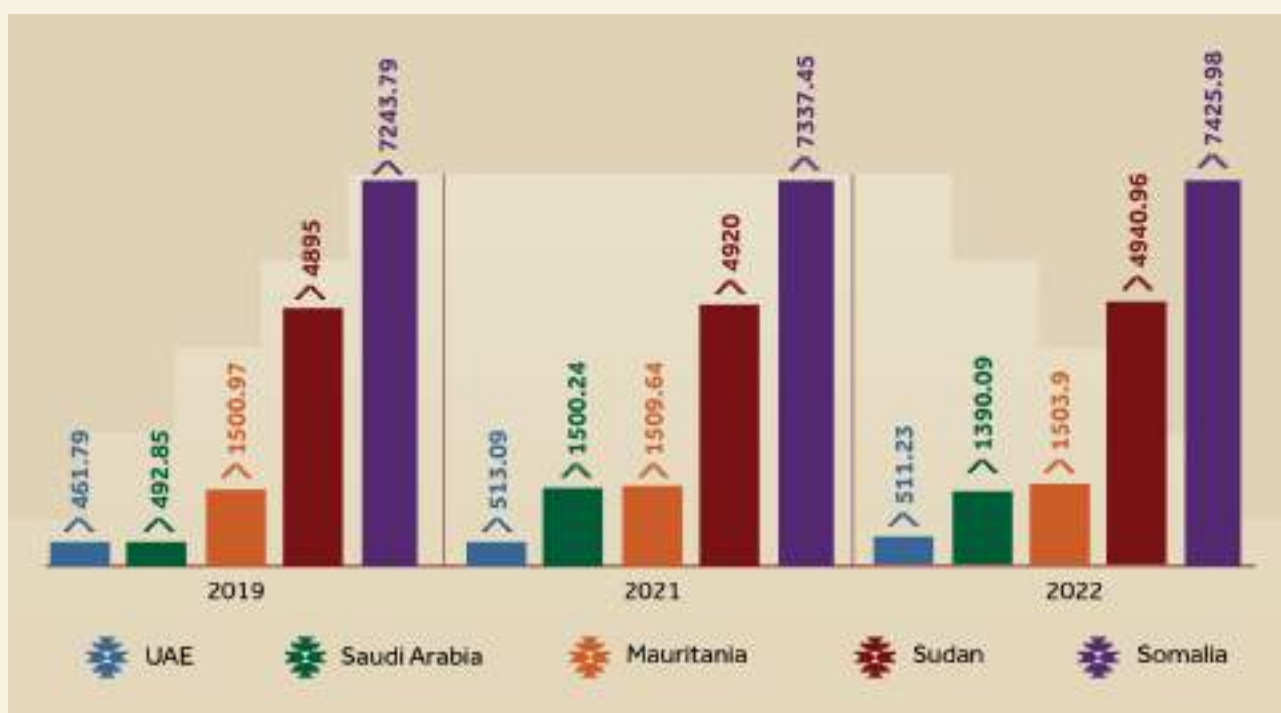
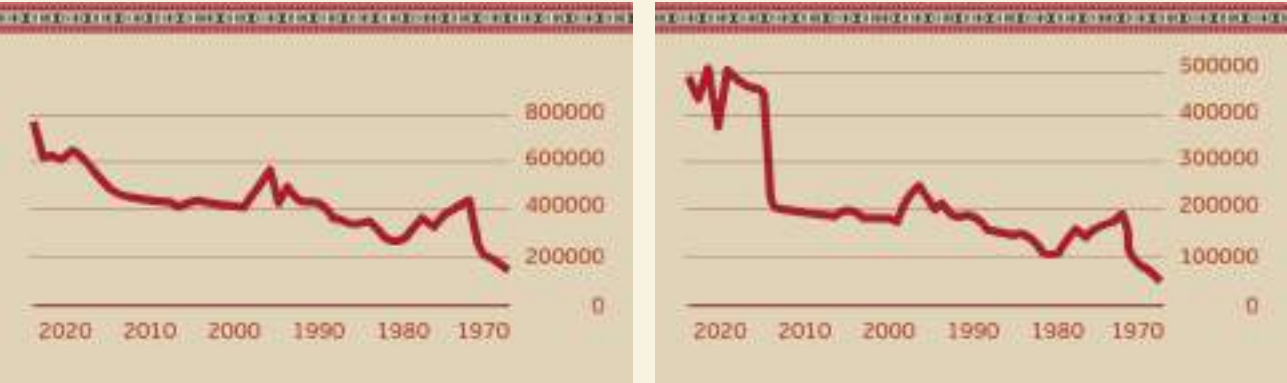


Figure (1): Number of camels in the top five Arab countries by herd size (in thousands of head) (3).

This report analyzes the size, production, consumption, and economic impact of the camel meat market in the Kingdom. In 2021, Saudi Arabia's production of camel meat accounted for approximately 25% of the total production in the Arab world and 18.32% of global production [6]. As shown in Figures [2] and [3], both the number of camels slaughtered and the quantity of meat produced have increased steadily over the past five decades, reaching 469,753 head and 73,751 tons, respectively, in 2022.



Figure(3): Quantity of Camel Meat Produced (in tons)(8) Figure(2): Number of Camels Slaughtered (8)

This growth reflects the success of government support programs, such as initiatives by the Ministry of Environment, Water, and Agriculture to establish specialized training centers and offer financial incentives to breeders. The significant increase in the overall herd size has allowed for expanded production while maintaining a stable breeding population [5]. Projections shown in Figure [4] indicate that this trend is expected to continue, with camel meat production forecast to reach 111,154 tons by 2035, reflecting an anticipated annual growth rate of 3.2%.

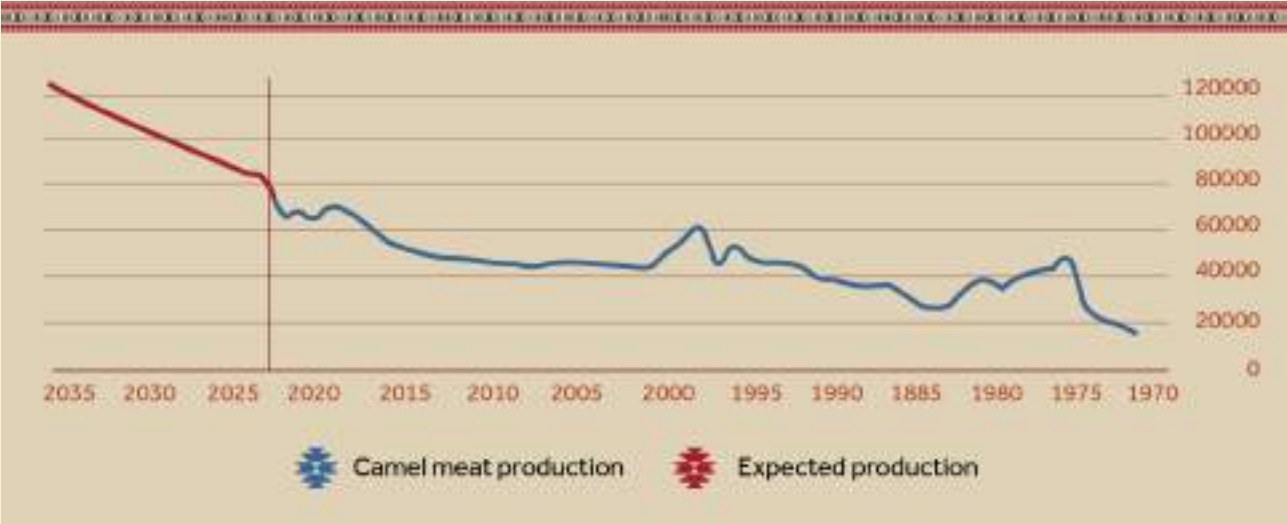


Figure (4): Projected Camel Meat Production for the Period 2023-2035 (8)



As illustrated in Figure [5], the distribution of the camel herd varies across the Kingdom. The Riyadh region is the most prominent area for camel breeding, accounting for approximately 30% of the total herd in 2022. The Eastern Region, Makkah, and Madinah regions collectively hold another 36.3%, meaning these four regions contain two-thirds of the Kingdom's camels [9].

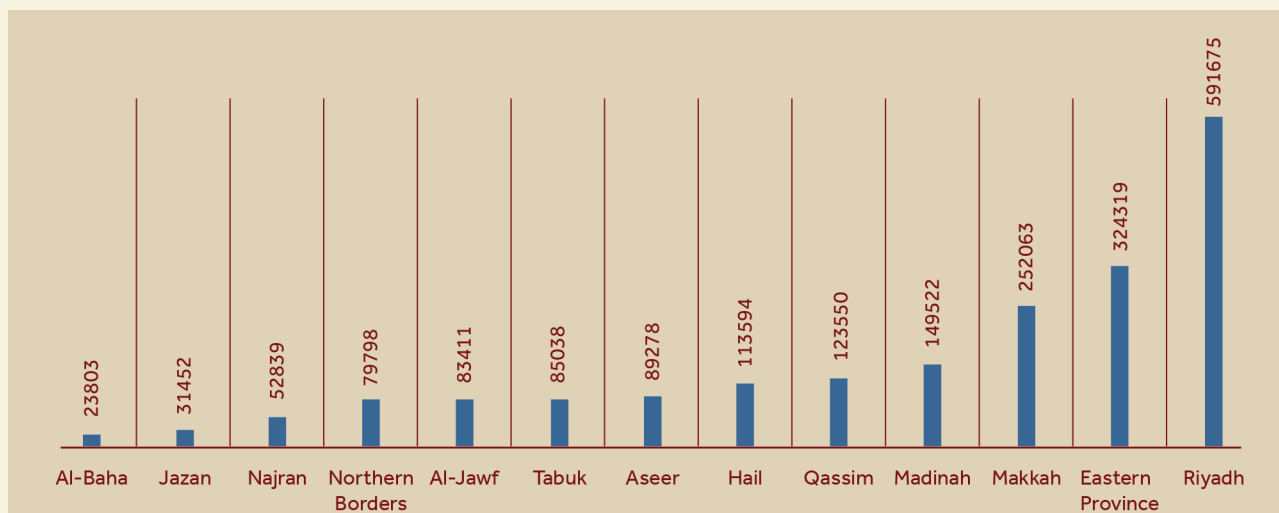


Figure (5): Number of Camels in Saudi Arabia by Region (2022) (9)

Local Consumption of Camel Meat

Local production met 76% of the national demand for camel meat in 2022, with 357,430 local camels slaughtered compared to 112,323 imported camels. As shown in Figure [6], the Riyadh region ranks first in consumption, accounting for 40% of the total camels slaughtered in the Kingdom, followed by the Makkah region at 18%.

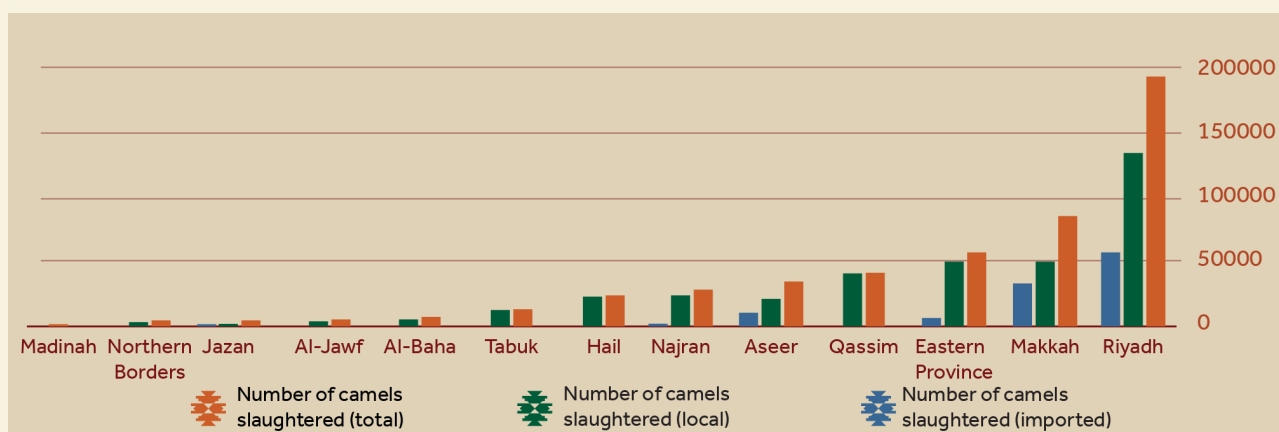


Figure (6): Number of camels slaughtered by region (9)

Figure [7] shows that the price of fresh camel meat has risen steadily, particularly since 2019. Between 2019 and 2023, the price per kilogram increased from 40.27 riyals to 53.86 riyals, an annual growth rate of 7.55%.

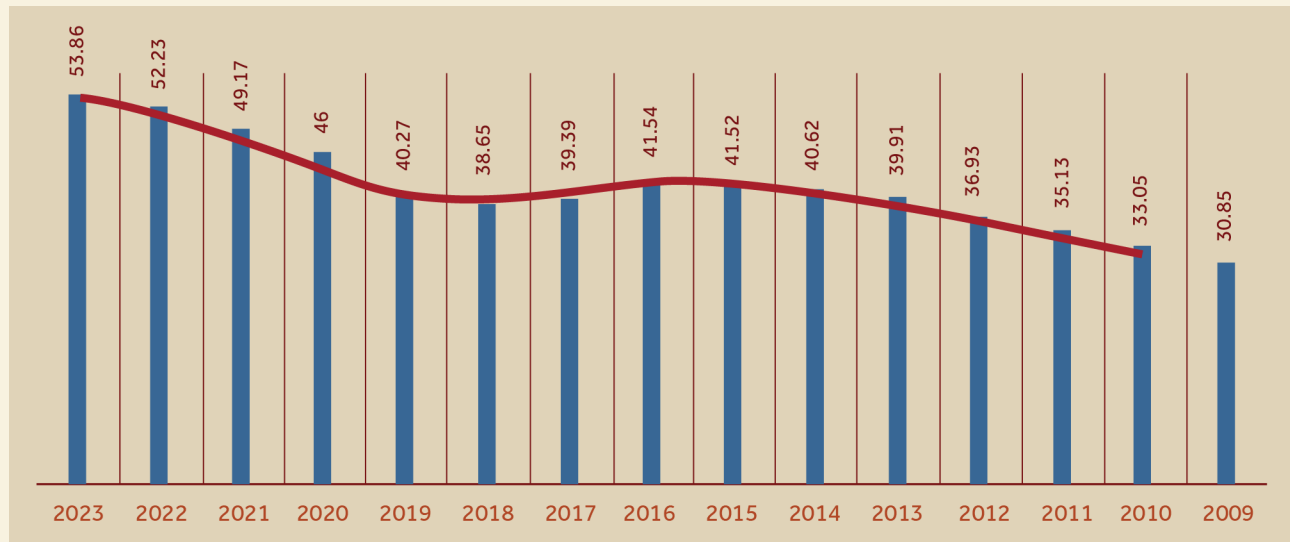


Figure (7): Prices of Fresh Camel Meat (per kilogram) (9)

Contribution of the Camel Meat Sector to the Economy:

According to data from the General Authority for Statistics, the camel meat sector contributes approximately 1-2% of the value added in the agricultural sector. Analysis indicates a positive correlation: a 1% increase in the value added from camel meat leads to a 0.71% increase in the value added from the agricultural sector as a whole. This highlights the sector's importance to the growth of the Kingdom's agricultural economy and its Gross Domestic Product (GDP).



Camel Milk Derivatives (Industry and Consumption)



Camel milk possesses numerous nutritional and therapeutic properties that distinguish it from other types of milk. It is more easily digested, making it a suitable alternative for individuals with lactose intolerance, and contains higher concentrations of antibacterial substances, giving it a longer shelf life. Studies have also suggested that camel milk can help improve long-term blood sugar control in patients with type 1 diabetes.



These properties make camel milk an ideal base for a variety of commercial products, including butter, cheese, chocolate, and ice cream, as shown in Figure [8]. Companies like SAWANI and its brand "Noug" have successfully overcome the technical challenges of processing camel milk to offer a range of high-quality derivatives to consumers.

Figure (8): Gelato product from the "NOUG" brand.

Camel Milk Derivatives Consumption Patterns

An exploratory study conducted for this report surveyed 224 adults in Saudi Arabia to investigate consumption patterns and perceptions of camel milk derivatives (see Appendix 3). The results revealed that while consumption is relatively low, consumers are primarily motivated by the products' nutritional value and therapeutic properties. The findings also indicated that a lack of information about the benefits of camel milk derivatives and concerns about taste and price are the main barriers to wider adoption. This suggests a significant opportunity for growth through targeted awareness campaigns and the development of a wider variety of products to meet consumer needs.

Example of the company (NOUG) in the use of camel milk derivatives

Sawani Company, owned by the Public Investment Fund, launched its brand "Noug" in 2023 to revive the culture of camel milk and promote high-quality camel products. The company, which has obtained FSSC 22000 and HACCP food safety certifications, offers a range of products, including fresh milk, butter, cheese, labneh, and gelato, all free from added phosphates or cane sugar. Sawani also plays a key societal role by launching community initiatives to raise consumer awareness and forming strategic partnerships, such as its agreement with AROYA CRUISES, to introduce Saudi heritage and culture to a global audience (8, 33, 34, 45).



Camel Fat in the Production of Soap, Candles, and Natural Cosmetic Products



Camel fat, particularly from the hump, is a valuable resource with significant potential in industrial applications. The fat contains 79 distinct fatty acids, giving it unique properties for use in soaps, candles, and natural cosmetics (17, 43, 46).

The use of animal fats in soap production is well-established, and camel fat offers the advantage of being a natural, sustainable resource suitable for sensitive skin. A patent was registered in 2023 for a medicinal soap made from camel hump fat, reinforcing the feasibility of producing high-value, chemical-free products for local and international markets [17]. While camel fat can also be used to produce candles, this may be less economically advantageous, as the wax derived from it can produce dense smoke compared to other waxes [43].

In the cosmetics industry, camel fat has been successfully used to create products such as a cocoa butter substitute. This points to a promising economic opportunity for investment in the natural cosmetic products industry, leveraging camel fat as a unique and sustainable raw material [46].



Camel Fat in Pharmaceutical Manufacturing



Camel fat is an important economic resource with significant potential in the pharmaceutical industry. The fat from a camel's hump, which constitutes about 8.6% of its total weight, is rich in fatty acids and vitamins that have been shown to have therapeutic benefits, including anti-inflammatory and antioxidant properties (2, 44). As detailed in Table 1, numerous patents have been registered globally for the use of camel fat in treatments for a range of conditions, from metabolic disorders to cancer.

Country	Patent	References
European Office	Use of camel fats in cancer treatment	15
China	Use of camel fats in making antibacterial body soap	16
China	Use of camel fats in making sunscreen for skin	17
Russia	Use of camel fats in regulating and treating metabolic disorders of fats and proteins in the body	18
China	Use of camel fats as a component in traditional Chinese medicine for treating malignant skin freckles (melanoma)	19
China	Use of camel fats as a component in traditional Chinese medicine for treating asthma and chronic respiratory infections	20
China	Use of camel fats as a component in traditional Chinese medicine for treating depression	21
China	Use of camel fats as a component in traditional Chinese medicine for treating menopause-related issues	22

Table 1. Patents Registered for Camel Fat

Camel fat offers commercial advantages over other animal fats due to its higher resistance to rancidity, which is attributed to its natural antioxidant content [39]. This stability makes it ideal for use in various applications. Furthermore, the availability of camels in the Kingdom means that camel fat can be obtained in large quantities and at a relatively low cost, creating a distinct economic opportunity. The global market for dietary supplements derived from animal fats is a high-value industry, and the beneficial compounds in camel fat, such as vitamins A, D, E, K, B1, and B2, can be extracted for use in various pharmaceutical formulations (24-28, 40, 41, 42).



Determining the Target Market Size for Pharmaceutical Products Containing Camel Fat in the Kingdom of Saudi Arabia

The Kingdom of Saudi Arabia is an ideal market for natural products derived from camels. There is a strong local culture that values camels and their traditional uses, alongside a growing consumer demand for natural and sustainable products focused on health and well-being [37]. Pharmaceutical products based on camel fat, such as ointments for treating wounds and skin inflammation, are likely to find significant acceptance among local consumers. This presents a clear opportunity that warrants further study of the supply chain's capacity to provide fat of a quality suitable for pharmaceutical manufacturing, as well as investment in the development and marketing of these innovative products.

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Camels in Fashion and Clothing





The fashion industry, including its related sectors of accessories, bags, and shoes, is a major driver of the global economy, representing the world's seventh-largest economy in 2023 (36, 37). In recent years, camel leather and wool have gained increasing prominence in the local and global fashion markets, including the luxury sector. This trend reflects a growing emphasis on sustainability and innovation, creating a significant opportunity for the Kingdom of Saudi Arabia. With coordinated support from the Ministry of Culture, the Fashion Commission, and the Ministry of Environment, Water, and Agriculture, the Kingdom is poised to develop a sustainable fashion industry based on its rich natural resources.

This chapter examines the uses of camel fibers, wool, and leather in the manufacturing of fashion, clothing, bags, shoes, carpets, and rugs. The data presented underscore the importance of the camel as a natural economic resource. With significant and growing domestic production of camel wool, the Kingdom can leverage these materials to build a sustainable and globally competitive textile and fashion industry.



Camel Fibers and Wool as Alternatives to Traditional Textiles in the Fashion Sector



The fashion sector has a substantial economic impact, with a market value equivalent to 1.63% of the annual global gross product [1]. This section highlights the role of camel derivatives in this industry, exploring the economic, artistic, and environmental benefits of using camel wool and leather in the production of clothing, accessories, and luxury goods.

Characteristics of camel fibers and wool

Camel wool is typically divided into two types based on softness: a soft, short undercoat with fine fibers, and a coarse outercoat with long, durable fibers, as shown in Figure [1]. The wool is further classified by its purity, with "natural wool" containing a maximum of 3% plant impurities and dirt, and "unclean wool" containing a higher percentage [32].



Figure (1) Images of camel fibers and wool

Camel Wool as an Alternative to Industrial and Traditional Textiles

Camel wool is a valuable natural resource that can strengthen the Kingdom's sustainable national economy [4]. Its properties are comparable to those of sheep wool, but its more accessible cost makes it an attractive alternative for producing high-quality textiles, especially for winter clothing and fashion [5]. Camel wool can be used to manufacture a wide range of products, including clothing, coats, traditional bishts (Figure 2), bags, shoes, ropes, and carpets (6, 7). It is distinguished by its low thermal conductivity, durability, light weight, and soft texture [6].



Figure (2) Winter bisht

The natural properties of camel wool make it a superior material for fashion applications



Durability and Resilience: Camel wool fibers can be bent 20,000 times without breaking, compared to cotton (3,000 bends) or rayon (75 bends). They can also be stretched by 25–30% before breaking and have a natural memory that allows them to return to their original shape [8].



Fire Resistance: Wool is naturally flame-retardant and self-extinguishes when a flame source is removed, producing significantly fewer toxic gases than synthetic fibers. This makes it one of the safest raw materials for environments with high safety requirements, such as aircraft and trains (33, 34).



Thermal Insulation: Camel wool is an excellent insulator, preserving warmth while allowing air to circulate next to the skin [9].



UV Protection: It offers high natural protection from ultraviolet rays, far exceeding that of most synthetic and cotton materials [10].



Hydrophilic Properties: The fibers have a strong affinity for water, making them easy to wash and dye [35].

Global and Local Production of Camel Fibers and Wool

Global annual production of camel wool is currently estimated at 3,000-3,500 tons, primarily from China and Mongolia. The United States is the largest consumer, using 70-75% of camel fibers in its spinning and weaving industries [11].

In Saudi Arabia, the expected annual production of camel wool is approximately 2,800 tons, with a value of 2.1 million US dollars [16]. This underutilized resource presents a significant opportunity to develop a sustainable domestic fashion industry. By leveraging local raw materials, the Kingdom can reduce its reliance on imports, support small and medium-sized enterprises, create new jobs in traditional cultural industries, and open new channels for export.



Figure [3] A horseman's attire made from camel wool, a piece by the Saudi designer Yahya Al Bishri at the "Camel Through the Ages" exhibition.

The Environmental Impact of Using Camel Wool

Using camel wool in the fashion industry is a sustainable choice compared to other textiles. Unlike cotton, which requires vast quantities of water, camels are adapted to arid environments, making their wool a more water-efficient material. The production of camel wool also requires less energy and fewer chemical interventions than synthetic fibers like polyester, resulting in lower carbon emissions and reduced environmental pollution. Furthermore, camel wool is highly durable, leading to longer-lasting products and less waste from fast fashion. As a natural fiber, it is completely biodegradable, decomposing in a fraction of the time it takes for synthetic materials.





Figure [4] Analysis of the environmental impact of using camel wool in the manufacturing of woolen clothes and bags

The Economic Impact of Using Camel Wool in the Saudi Clothing Sector

Employing camel wool as a locally available raw material offers significant economic benefits for the Kingdom's fashion and clothing sector. As an underutilized resource, it represents a sustainable and cost-effective alternative to imported agricultural and synthetic fibers. The production of clothing and bags from camel wool can generate new job opportunities in both wool collection and manufacturing, supporting the growth of national industries and contributing to Saudi Arabia's national income. With growing global demand for clothing made from natural fibers, there is a clear opportunity to establish a Saudi brand specializing in high-quality camel wool products for both domestic and export markets.



Figure [5] Analysis of the economic impact of using camel hair in industry

Camel Leather in the Manufacture of Shoes, Bags, Clothing, and Accessories



Camel leather is a valuable natural resource distinguished by its exceptional durability and endurance, making it an ideal material for manufacturing luxury leather goods [14]. The market for camel leather in Saudi Arabia is estimated at approximately 7.98 million US dollars annually [17]. Given the development of value chains associated with contemporary fashion, accessories, and furniture, industries based on camel hides can provide significant support to the local economy and create new investment opportunities (18, 19).

The success of "Tamashi," a company established approximately 10 years ago that produces luxury shoes, bags, and accessories from camel leather, highlights the economic potential of this sector. This model confirms that there are significant future opportunities for industries based on camel leather, warranting specialized studies and investment to expand their scope and achieve tangible economic returns.



Figure [6] Wallet made from 100% camel leather by Tamashi Company [30]

The Economic Importance of the Fashion and Leather Industries in Saudi Arabia

Utilizing camel hides contributes to diversifying local leather industries, helps reduce the import of finished goods, and develops Saudi exports of leather products to global markets. Furthermore, the growth of the Saudi leather market provides new job opportunities in various fields, including leather tanning, design, manufacturing, and marketing, which motivates the workforce to learn the craft of producing high-quality leather goods. It also supports the development of small, medium, and large enterprises, creating a fertile ground for a sustainable and growing leather industry that can expand from a local to a global reach (21, 24).



Leather Industries Producing from Camel Hides



Fashion and Clothing Handbags, shoes, hats, belts, gloves, wallets, mobile phone covers, and key holders [22].



Household Goods Coffee pots (dallahs), water-carrying pots, and other traditional tools [23].



Bookbinding Binding books and manuscripts, a process known as tasfeer [20].



Military and Equestrian Sheaths for swords and daggers, quivers for arrows, and horse saddles.



Furniture Leather cushions, office supplies, and tents [21].

Camel Wool in the Manufacture of Carpets and Rugs



The global demand for sustainable materials is growing. In 2022, the production of natural fibers like cotton and wool increased, while the production of fossil fuel-based synthetic fibers also rose, with total global fiber production expected to grow from 116 million tons in 2022 to 147 million tons in 2030 [25]. This trend highlights the need to accelerate the shift toward renewable, bio-based raw materials. Natural fibers like camel wool are a renewable, carbon-free resource that can play a key role in the green economy. They absorb carbon dioxide during their growth, produce organic waste that can be used to generate energy, and are 100% biodegradable at the end of their life cycle [31].

Suitability of Camel Wool in Carpet Manufacturing

Camel wool possesses several properties that make it highly suitable for carpet manufacturing. Its high durability, a result of the fibrous layer and scales covering the fibers, makes it strong and capable of withstanding heavy use. Its superior elasticity allows it to regain its shape after stretching, maintaining its appearance without wrinkling. One of its most important features is its capacity for felting, which allows the wool to be easily transformed into a cohesive and strong fabric (27, 28). The length and fineness of the fibers, which vary by camel breed, affect the softness and quality of the final product, while the wool's natural luster enhances the beauty of the finished fabric [29].

In conclusion, the use of camel wool and leather presents a golden opportunity for establishing luxury industries in the fashion and furnishings sectors. These sustainable, renewable, and environmentally friendly raw materials possess the high quality and aesthetic appeal to attract investment and drive economic growth. By supporting workers in camel-based industries, raising the quality of production to compete globally, and adopting modern, sustainable practices, the Kingdom can transform this sector into a strategic industry that enhances the Saudi economy, reduces waste, and creates new opportunities for generations to come.

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The Future of Camel Economies





As the Kingdom of Saudi Arabia accelerates its technological development, the camel sector is heading toward a promising future. The goal is to develop this vital sector sustainably, in a way that preserves heritage while protecting the environment. This chapter addresses several topics related to the future of the camel economy, foremost among them the role of modern technologies—such as virtual and augmented reality—in improving camel breeds, increasing productivity, enhancing healthcare, and developing the sport of camel racing globally.

The chapter also reviews the most prominent challenges facing the camel sector, including health and climate-related issues, and proposes innovative solutions to overcome them. By leveraging technology and innovation, the camel industry can be transformed into an advanced digital sector that contributes to preserving cultural heritage while strengthening the Kingdom's position on the global economic map. This chapter affirms the important role the Kingdom can play in leading research and development in this vital field.



Sustainability in Camel-Related Fields



Camels play a crucial role in achieving food security, especially in arid and semi-arid regions. By providing a diverse and adaptable food source, they contribute to supporting sustainable food systems in environments where raising other livestock is difficult (5, 6). This makes them a strategic option for ensuring food and economic security in the Kingdom, providing job opportunities in grazing, dairy production, and leather manufacturing (5, 6, 7). To successfully transform the camel sector into a sustainable industry, it is essential to adopt strategies that account for current and future social, economic, and environmental conditions.

Strategies for Enhancing Sustainability in the Camel Sector

This report reviews several strategies that can contribute to building an integrated model for sustainable camel development, one that improves productivity while preserving natural resources for future generations.



Protection of Natural Resources and Pasture Management

To avoid pasture degradation, the number of camels in any given area must be determined based on the quality of vegetation and available water. Sustainable grazing systems, such as rotational grazing, must be applied, and modern technologies like GPS and drones can be used to monitor pasture health, track herds, and manage grazing more effectively. The National Strategy for Natural Pastures, part of the Saudi Green Initiative, aims to protect 30% of the Kingdom's pasture area, which will improve the efficiency of animal production and alleviate pressure on natural resources (10, 11, 12, 57).

The Role of Modern Technologies

Achieving sustainability in the camel sector requires adopting advanced production systems. Modern health prevention programs, smart diagnostic technologies, and the use of veterinary robotics can improve healthcare, reduce reliance on antimicrobials, and enhance public health (13, 14). Artificial intelligence (AI) can also transform remote monitoring and veterinary diagnostics, allowing for the early detection of health problems through the continuous tracking of vital signs [15].

Spreading Environmental Culture

Raising environmental awareness about key issues is crucial for achieving sustainable development goals. Training herders and farmers on the best sustainable practices for managing herds and pastures, and disseminating modern agricultural technology, is an essential part of this effort.

Investing in Scientific Research

Investing in scientific research and applying its outcomes is vital for improving the productivity and efficiency of camels through environmentally friendly methods. Supporting research aimed at developing camel genetics, managing genetic diversity, and enhancing the efficiency of resource use (e.g., reducing water consumption) can increase productivity while reducing the sector's environmental impact. The Camel Studies Grant, launched in 2024 by the Ministry of Culture in collaboration with the Ministry of Environment, Water, and Agriculture, covers six main areas related to the historical, cultural, social, economic, environmental, and health aspects of camels, demonstrating a national commitment to advancing research in this field [16].



Encouraging Innovation in Business Practices

Developing effective and comprehensive camel markets is essential for ensuring the availability of safe, high-quality camel products. Launching e-stores, virtual markets, and mobile sales outlets for camel products will add a modern and sustainable shopping experience for consumers. Producing and exporting these products in ways that adhere to environmental standards will contribute to developing the local economy while preserving natural resources.

Elevating Sustainable Tourism

Camels play a pivotal role in supporting sustainable tourism in the Kingdom. Organizing sustainable tourist trips that include safari excursions and visits to local farms can enhance cultural and environmental tourism. By rediscovering and developing historical camel routes, investment and tourism companies can create unique cultural paths, rehabilitating old houses into rural inns and facilitating access to camel-related locations, thereby benefiting local communities [17].

Camel Racing Around the World



Camel racing is one of the principal fields in the camel industry, and its future will be shaped by numerous variables, including technological development. Virtual and augmented reality (VR/AR) technologies, in particular, are poised to herald a new era for camel racing in the Kingdom and around the world.

Camel Racing: A Multi-Million Dollar Sport

Camel racing (Hijan) is one of the most famous traditional sports in the Arab world, with a history dating back to the pre-Islamic era. It enjoys great popularity in the Kingdom of Saudi Arabia, the United Arab Emirates, and Qatar. Racing camels are specially bred and trained for several years, and they can reach speeds of up to 64 km/h. It is a high-cost sport, requiring significant financial investment in the purchase, training, feeding, and transportation of the camels, with some animals selling for hundreds of thousands of dollars.

Growth Strategies for Virtual and Augmented Reality in Camel Racing

Despite its popularity, camel racing is not as widely presented in a digital format as other sports. VR and AR technologies offer a significant opportunity to change this. Through VR, the public can watch races as if they were present at the track, with access to real-time data on the competing camels and their speeds. VR can also be used as a training tool for participants, allowing them to test different strategies in a virtual environment without risk.

AR can enhance the spectator experience at live events and in museums by providing interactive educational content about the history and culture of camels. AI can also play an important role by analyzing race data to provide the public with accurate predictions about the potential performance of camels. Furthermore, virtual auctions and digital records for participating camels can enhance transparency and attract a wider audience of enthusiasts and investors (18, 27, 28, 29, 58).



Virtual Camel Markets and Auctions



Integrating AR tools into livestock management can lead to faster decision-making and improved monitoring of animal health. The camel industry can benefit significantly from the detailed insights provided by virtual markets. For breeders, AR is an innovative sales tool that provides a competitive advantage. They can create three-dimensional images or interactive models of their camels, displaying the animals to a wider audience without the need for physical transport. The buyer's experience can also be enhanced through tools like a "virtual health check," which allows users to view a camel's health metrics, such as its heart rate, muscle strength, and genetic information [32].

Virtual reality (VR) has already changed the way auctions are conducted in the horse and cattle industries, allowing participants from anywhere in the world to attend via VR headsets [33]. This immersive, 360-degree experience, which simulates the sights and sounds of a traditional market, has been shown to increase participation and raise average sale prices.

The Economic, Health, and Ethical Considerations of Virtual Camel Markets

Virtual camel markets may help achieve economic and health benefits, as well as environmental and ethical advantages. However, these markets also face challenges, such as resistance from some traditional communities and the difficulty of accurately assessing animals solely via virtual platforms. Furthermore, this field requires more research to fully understand its economic benefits and ensure its responsible implementation (34, 35).

Challenges and Innovative Solutions Facing the Camel Sector



The camel sector faces a number of significant challenges that require innovative solutions to ensure its long-term sustainability and growth.

Key Challenges

Infectious Diseases and Epidemics

Although camels are highly resistant to many diseases, they can contract serious infectious and zoonotic diseases that can cause significant economic losses and pose a risk to public health (55, 56).

Weak Infrastructure and Lack of Modern Technologies

The sector still suffers from a lack of organized markets, veterinary care centers, and logistical transport for camels and their products. There is also a scarcity of innovation in smart health monitoring systems and resource management (big data).

Climate Change, Desertification, and Pasture Degradation

Climate change, recurrent drought, and overgrazing significantly affect the availability of natural pastures and water, leading to desertification and threatening the health and productivity of camels (36, 37).

Economic, Cultural, and Educational Challenges

A lack of awareness about the importance of innovation, insufficient training for breeders in modern management methods, and fluctuations in feed prices pose significant financial and educational burdens [39].

Consumer Behavior and Competition

Changes in consumer food habits and intense competition from other agricultural sectors, such as cattle and sheep, limit the market for camel products and can make camel breeding less profitable for investors (52, 53, 54).

Innovative Solutions

Technologies for Early Warning, Monitoring, and Response

Innovative early warning systems using AI, the Internet of Things (IoT), and robotics can be created to analyze health data, predict disease outbreaks, and permit early intervention. Modern technologies like drones and wearable sensors can also be used to monitor herds in vast pastures, tracking their health status and allowing breeders to respond immediately to any potential problems (37, 38).

Adaptation to Climate Change and Smart Management of Resources

In light of climate change, innovative solutions must be adopted for managing natural resources. This includes rehabilitating degraded pastures, cultivating drought- and salinity-resistant plants, and implementing smart farming systems that rely on technologies like the IoT to provide suitable environments for camels even in harsh climatic conditions.

Innovations in Improving Productivity and Supply Chains

The unusual genetic makeup of camels is the main reason for their ability to survive under harsh environmental conditions [39]. Genetic screening can help identify the most suitable breeds for different production purposes, and modern genetic engineering applications can contribute to improving their traits. Digital transformation and e-commerce platforms can also improve the efficiency of supply chains for camel products, enhancing income for breeders and encouraging investment.

Innovation in Finance and Breeder Support

Innovative financial solutions, such as crowdfunding and specialized insurance, can offer financial support to breeders, especially during periods of drought or epidemics. E-learning platforms and smartphone applications can also provide breeders with access to the latest information on camel care, nutrition, and modern management methods.



The Role of the Kingdom of Saudi Arabia in Providing Innovative Solutions

The Kingdom of Saudi Arabia, through its universities, research centers, and specialized scientific chairs, plays an important role in the research and development of the camel sector. King Faisal University, for example, has a specialized Camel Research Center that conducts research on everything from camel physiology to genetic improvement and disease prevention [40]. Other academic institutions, such as King Saud University and Qassim University, also have programs focused on improving camel health, breeding, and productivity (41, 42).

Through government initiatives and private sector support, the state invests in documenting and preserving traditional knowledge about camels while promoting modern scientific approaches. The comprehensive camel genome scanning project, launched by the Ministry of Environment, Water, and Agriculture in 2023, is one of the most important projects in designing a genetic code specific to camels [43]. The Kingdom is also working on electronically tagging and registering camels to control their movement, combat epidemics, and build a comprehensive database that facilitates ownership transfer and allows for accurate monitoring of the national herd (45, 46).

At the world's first camel technology conference, "Camel Tech," held in Doha in 2023, the Kingdom of Saudi Arabia presented its work on developing AI applications in the camel sector across three pathways: the smart identification of camels' natural characteristics, the automated assessment of camel beauty and market value, and an integrated disease detection and management platform [44].

The Kingdom is also deeply committed to preserving the cultural heritage of camels through events like the annual King Abdulaziz Camel Festival. By collaborating with international organizations such as the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (WOAH), and by hosting international conferences on camel health and breeding, the Kingdom is positioned to lead global efforts in research, innovation, and the sustainable development of the future of the camel economy (47, 48, 49, 50).

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Conclusion

This report has provided a comprehensive analysis of the camel sector in the Kingdom of Saudi Arabia, affirming the camel's dual identity as both a cornerstone of national heritage and a dynamic component of the modern economy. The designation of 2024 as the "Year of the Camel" by the Ministry of Culture underscores a national commitment to preserving this legacy while unlocking its future potential.

The analysis has traced the deep historical and cultural bond between the people of the Arabian Peninsula and the camel, a relationship immortalized in ancient rock art, classical poetry, and contemporary cinema. It has examined the pivotal role of camel festivals, such as the King Abdulaziz Camel Festival, as powerful platforms for cultural expression, tourism, and economic stimulation.

Economically, the report has detailed the significant contributions of the camel sector. This includes the market for camel derivatives—such as meat, which adds 1-2% of value to the agricultural sector, and milk and fat, which are foundational to growing food, cosmetic, and pharmaceutical industries. Furthermore, the report has highlighted the untapped potential of camel wool and leather as sustainable, high-quality materials that can drive growth and innovation in the national fashion and textile industries.

Looking forward, the report has identified both the challenges and the immense opportunities that lie ahead. By embracing modern technologies like artificial intelligence and virtual reality, adopting sustainable practices in pasture management, and fostering innovation, the Kingdom can overcome obstacles such as climate change and disease.

Through continued investment in research, strategic development, and the preservation of cultural traditions, the camel sector is poised for significant growth. This report serves as a foundational document, providing a deeper understanding of the sector's complexities and offering a clear vision for its future as a vital contributor to the Kingdom's diversified and sustainable economy.





Appendix No. (1)

Environmental Analysis of Camel Festivals in the Kingdom

Analysis of Strengths, Weaknesses, Opportunities, and Challenges for Camel Festivals and Events in the Kingdom

This appendix presents a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) for the camel festival and events sector in the Kingdom of Saudi Arabia. The analysis is based on secondary data and responses from a sample of event officials, camel breeders, participants, and public attendees. The Internal Factor Evaluation (IFE) Matrix identifies internal strengths and weaknesses, while the External Factor Evaluation (EFE) Matrix identifies external opportunities and threats. Each factor was assigned a relative weight based on its perceived importance, and the final weighted score was calculated to determine its overall impact.

Internal Factor Evaluation (IFE) Matrix Table

#	Strength Factors	Relative Weight	Value	Weighted Score
S1	The historical, cultural, and political status of the Kingdom of Saudi Arabia in the region and the world.	0.199	4	0.796
S2	What camels represent as a distinct cultural heritage constituting a source of pride for Saudis.	0.065	3	0.195
S3	The Camel Club and the Saudi Camel Racing Federation, and their role in serving camel owners and breeders.	0.062	3	0.186
S4	Festivals and cultural events represent a vital element in improving the quality of social life.	0.048	2	0.096
S5	Festivals contribute to enhancing and stimulating local economic activity.	0.065	3	0.195
S6	Development of infrastructure in the areas where events are held.	0.099	2	0.198
S7	Providing job opportunities for local communities.	0.099	3	0.297
S8	Enhancing tourism and sustainable development.	0.065	2	0.130
S9	Achieving social peace and stability, and providing an outlet for Saudi youth.	0.054	3	0.162
S10	Opening new paths for government and private sector investments, allowing for economic diversification.	0.032	2	0.064
S11	Helping entrepreneurs find diverse investment opportunities in the camel sector.	0.033	2	0.066
S12	Increasing consumption of goods and services associated with the events.	0.045	1	0.045
Sub-Total (Strengths)		0.866		



#	Weakness Factors	Relative Weight	Value	Weighted Score
W1	The necessary infrastructure for the festival and events industry still requires much development.	0.042	3	0.126
W2	There is still a need for legislative development to serve and unify efforts aimed at organizing camel festivals and events in KSA.	0.024	1	0.024
W3	Weak electronic linkage between concerned entities responsible for organizing festivals and events.	0.033	2	0.066
W4	Weak level of partnerships with relevant international organizations.	0.035	2	0.070
Sub-Total (Weaknesses)		0.134		
Total		1		

External Factor Evaluation (EFE) Matrix Table

#	Available Opportunities	Relative Weight	Value	Weighted Score
O1	The Kingdom's Vision 2030, its objectives, and its support for tourism and organizing festivals and events in the Kingdom.	0.199	4	0.796
O2	Saudi government's interest in the camel sector and its pursuit of development.	0.074	4	0.296
O3	Saudi government's support for cultural, tourism, and entertainment activities.	0.052	3	0.156
O4	Economic, cultural, educational, and tourism opportunities provided by the government in this growing sector.	0.044	4	0.176
O5	Government support for camel economies represented in its various products, and diversity of its use areas (food, health, economic).	0.063	3	0.189
O6	Government support and creation of partnership mechanisms between public and private sectors for investment in the camel field.	0.095	3	0.285
O7	Launch by the Ministry of Environment, Water, and Agriculture of the electronic platform "Anaam Platform" to compile data on camel breeders.	0.199	3	0.597
O8	Support from the Kingdom's leadership and government to attract foreign investments in all sectors.	0.065	2	0.130
O9	Significant development in the information technology system in the Kingdom.	0.062	3	0.186
O10	Launch by the Ministry of Environment, Water, and Agriculture of the camel tagging project.	0.062	1	0.062
Sub-Total (Opportunities)		0.915		

#	Potential Threats	Relative Weight	Value	Weighted Score
T1	Intense competition in this sector, especially from Gulf countries.	0.055	4	0.220
T2	Veterinary health risks.	0.030	2	0.060
Sub-Total (Threats)		0.085		
Total		1		





Appendix No. (2)

Analysis of the Survey on the Indirect Economic Impact of Camel Festivals

Study Methodology

To evaluate the indirect economic impacts of camel festivals, this study relied on a descriptive analytical method. The analysis focused on three main axes: the increased demand for goods and services, the impact on the local labor market, and the contribution to stimulating tourism during festival periods. A survey was designed using a five-point Likert scale (1=Strongly Disagree to 5=Strongly Agree) and distributed to a random sample of investors, camel owners, organizers, competitors, and visitors during the Jaddat Al-Ibil Festival in Taif (September 19-26, 2024). Responses were provided voluntarily and anonymously.

Table No. (1): Likert Scale Scores

Code	1	2	3	4	5
Rating	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Characteristics of the Study Sample

Of the survey participants, 97.67% were male and 2.33% were female. The largest group of respondents (34.9%) were visitors, followed by camel owners (16.3%), investors (13.96%), and competitors (11.63%). Approximately half of the sample (46.5%) held a bachelor's degree.



Table No. (2). Characteristics of the Study Sample

Variable		Percentage
Gender	Male	97.67%
	Female	2.33%
Age	18-24	7%
	25-34	16.3%
	35-44	41.9%
	45-54	23.3%
	More than 55	11.6%
Educational Level	High school or less	39.5%
	Bachelor's degree	46.5%
	Postgraduate studies	14%
Region	Riyadh	18.6%
	Eastern Province	30.2%
	Hail	37.2%
	Qassim	4.7%
	Makkah Al-Mukarramah	9.3%
Capacity/Role	Visitor	34.9%
	Competitor	14%
	Investor	11.6%
	Camel Owner	16.3%
	Organizer	23.3%

Analysis of Survey Results

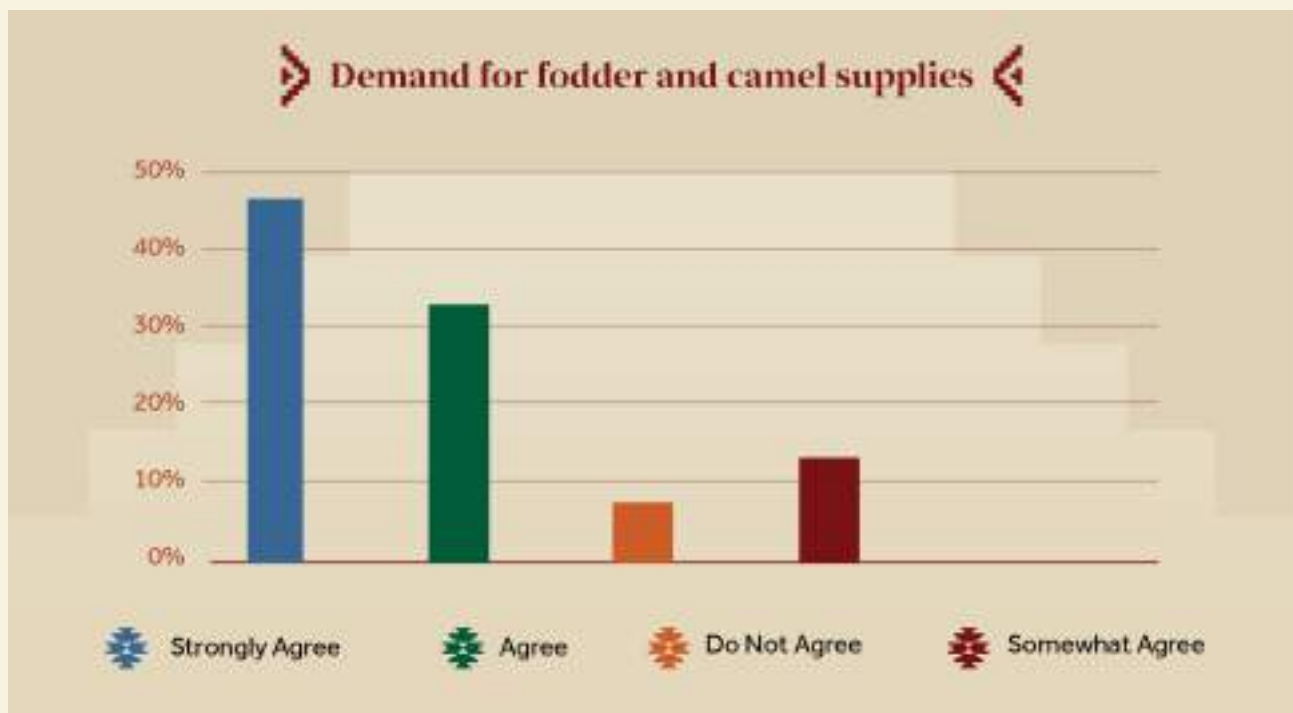
A. Impact of Camel Festivals on the Demand for Goods and Services

The survey results indicate a strong correlation between camel festivals and increased demand for related goods and services.

Feed and Supplies: A significant majority of participants (79.1%) confirmed that festivals lead to a rise in demand for camel feed and other supplies. This stimulates the feed industry sector and creates investment opportunities.

Transportation: An overwhelming majority (90.7%) confirmed a noticeable increase in demand for transportation services and equipment during festival periods. This highlights that camel festivals are not merely social events but are part of a broad economic value chain.

Hospitality and Accommodation: Similarly, 97.7% of participants indicated a noticeable increase in demand for various accommodation and hospitality services, including hotels, overnight tents, and local restaurants. This growth opens broad prospects for investment in tourism services.



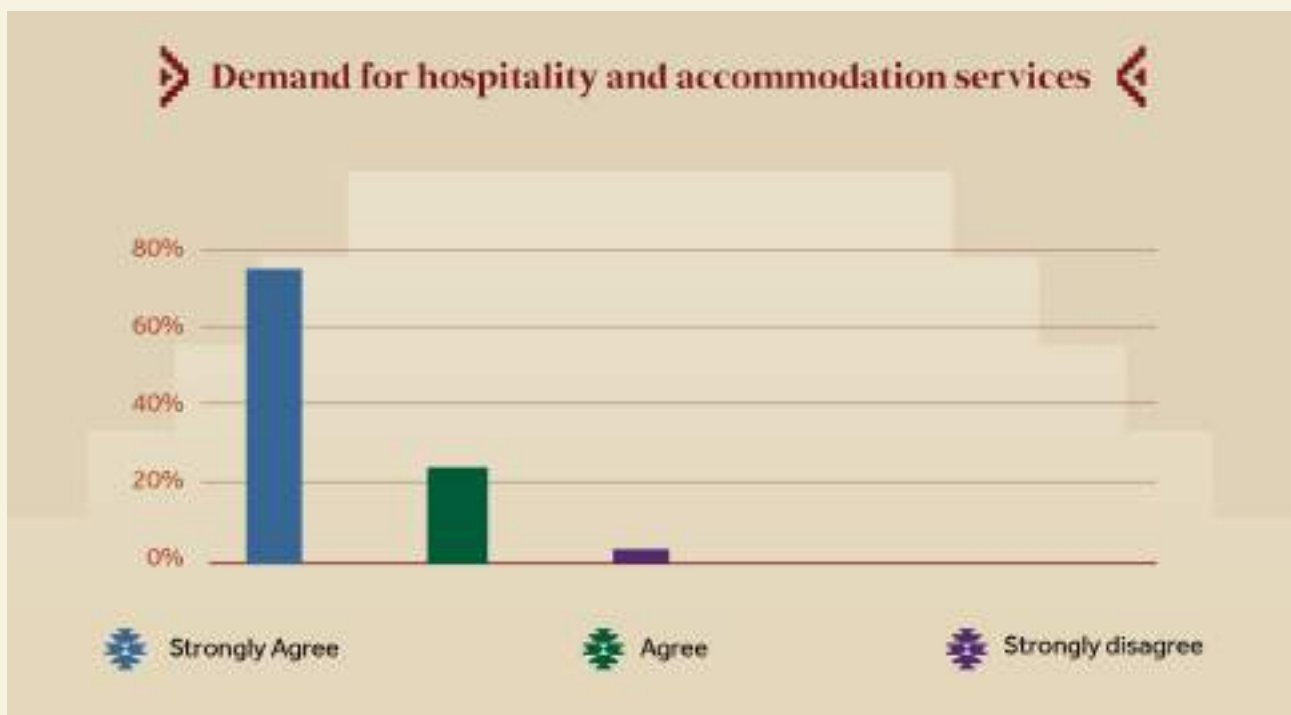
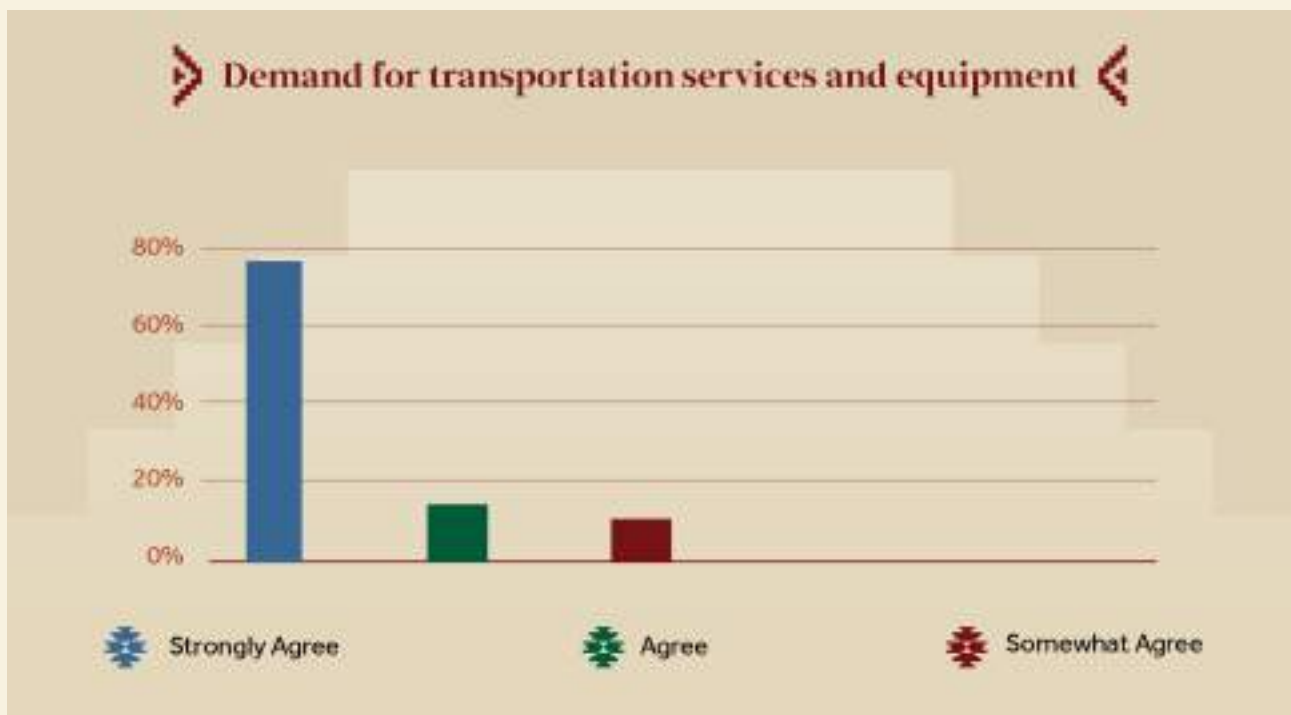


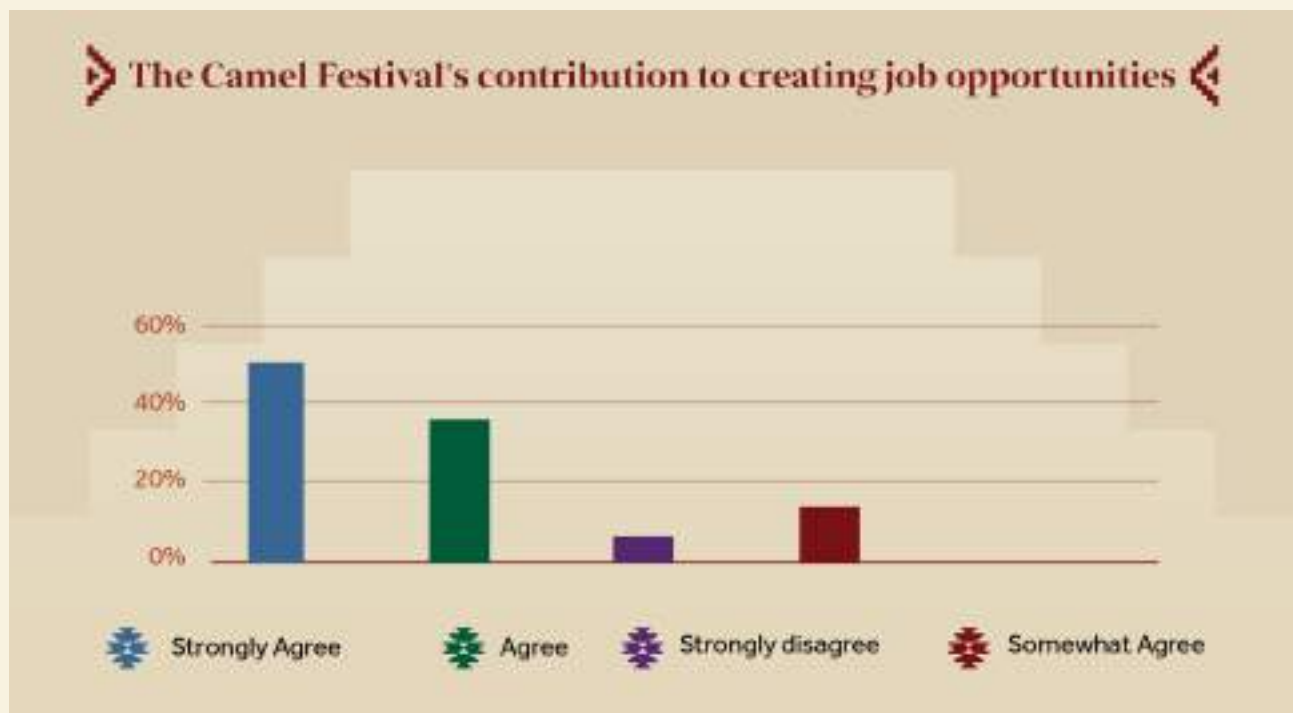
Figure No. (2). Demand for Goods and Services during the Camel Festivals Period

B. Impact of Camel Festivals on Labor Market Indicators

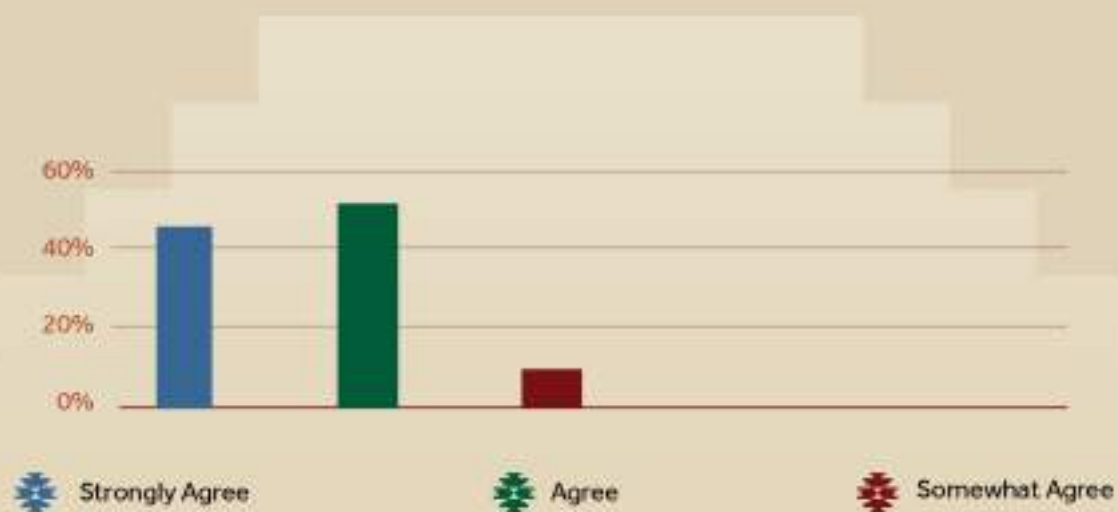
The survey results confirm the significant role of camel festivals in stimulating the local labor market.

Job Creation and Income: A large percentage of the sample (83.7%) indicated an increase in employment opportunities as a result of camel festivals. Furthermore, 93% of participants believe the festival period coincides with an increase in income for individuals residing in areas near the events.

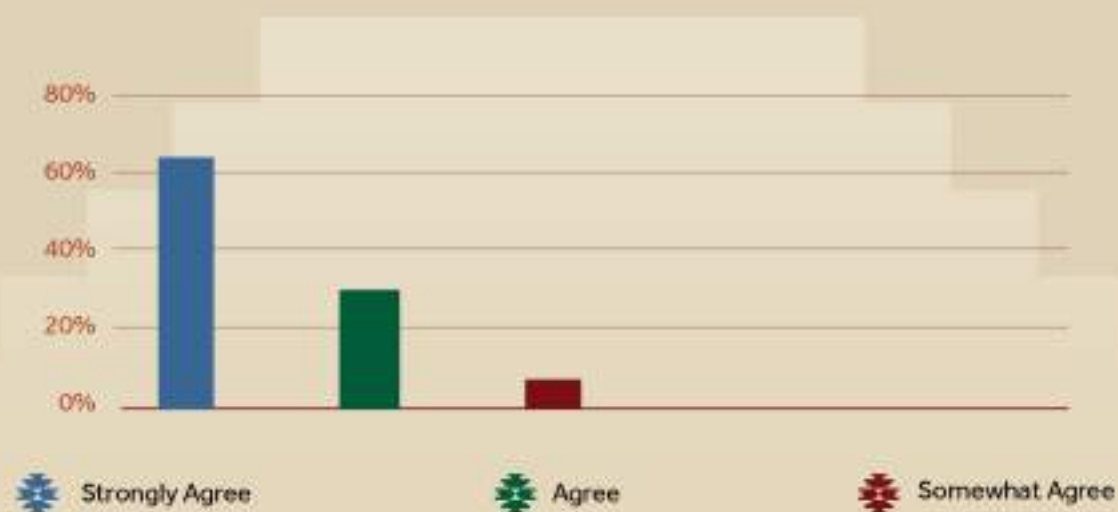
Skills Development and Business Efficiency: The results show that a large percentage of participants (93.3%) affirm the role of festivals in enhancing interaction among camel breeders and facilitating the exchange of knowledge. Additionally, over 95% of participants believe that festivals play a crucial role in stimulating growth in related manufacturing industries, such as camel leather and dairy products.



➤ The Camel Festival's contribution to improving incomes ➤



➤ The Camel Festival's contribution to skills development ➤



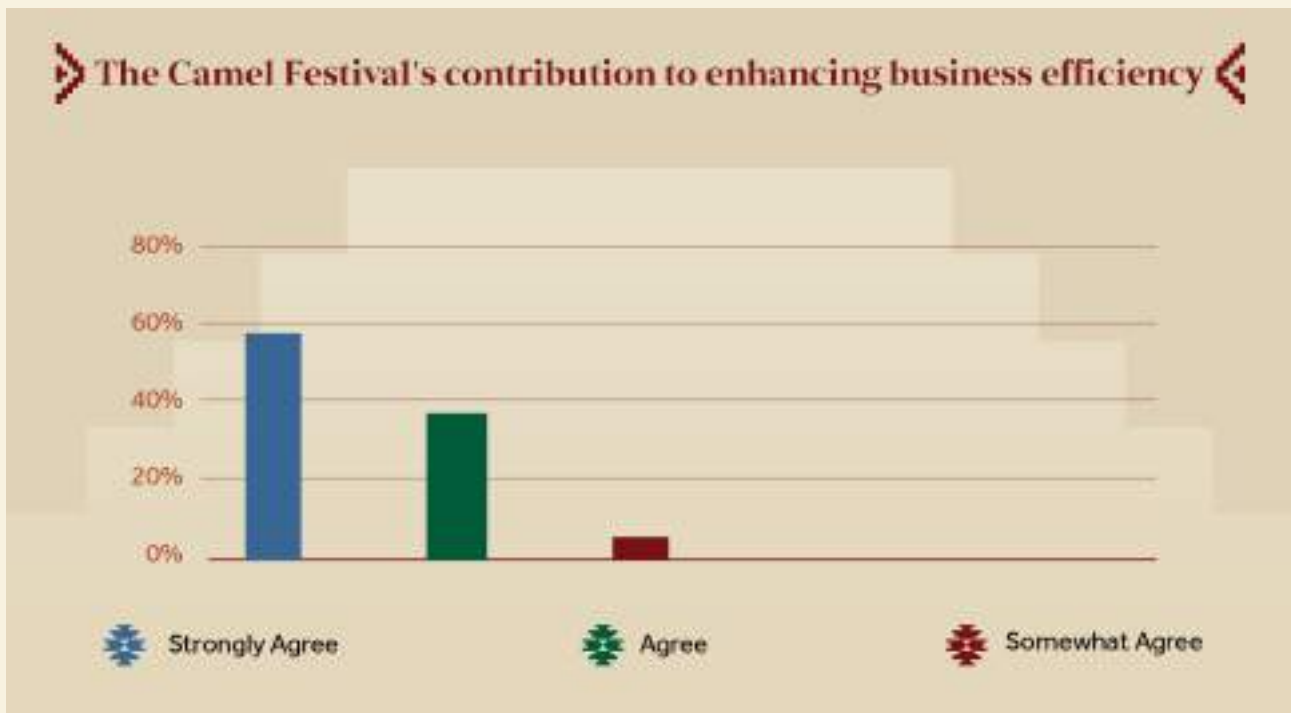


Figure No. (3). Impact of Camel Festivals on the Labor Market

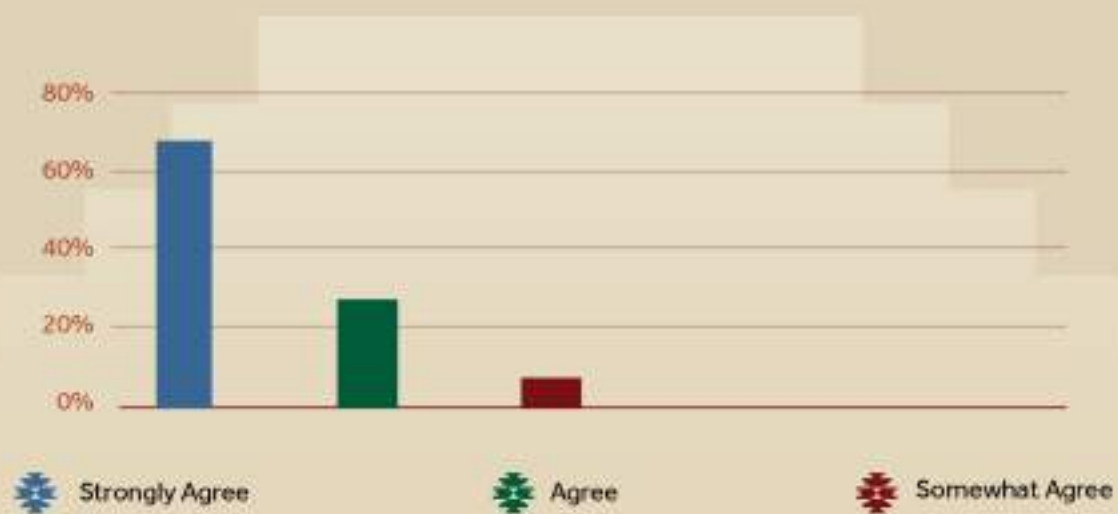
C. Impact of Camel Festivals on the Tourism Sector

The survey confirmed that camel festivals are a major attraction for both local and international tourists seeking a unique cultural experience.

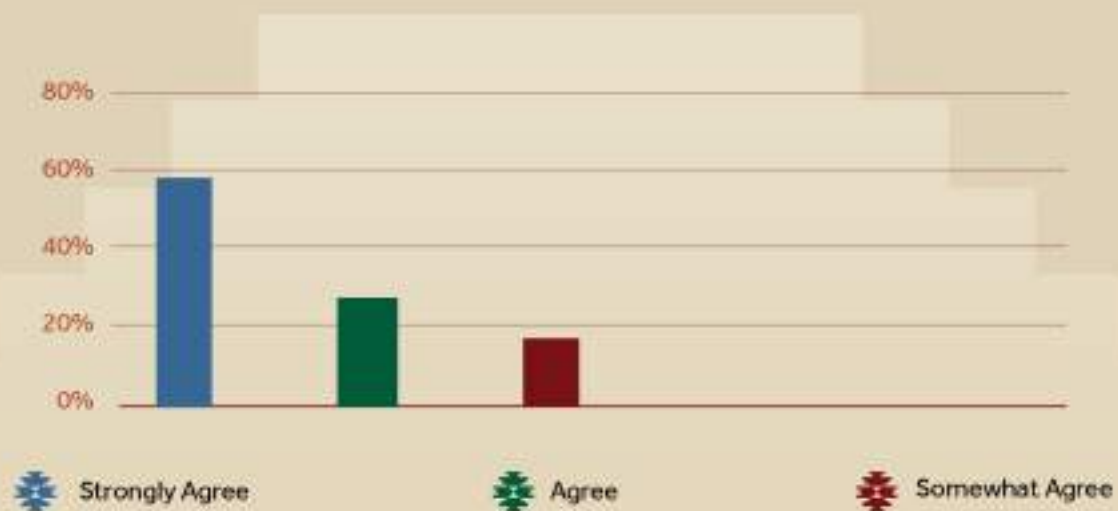
Tourism Stimulation: 93% of survey participants indicated that camel festivals contribute to stimulating local tourism.

Attractive Events: Camel competitions were considered among the most attractive events for tourists by 83.7% of participants. Heritage markets and exhibitions were rated even more highly, with 88.4% confirming their appeal. Artistic and poetry performances were also seen as important for attracting tourists by 81.4% of respondents.

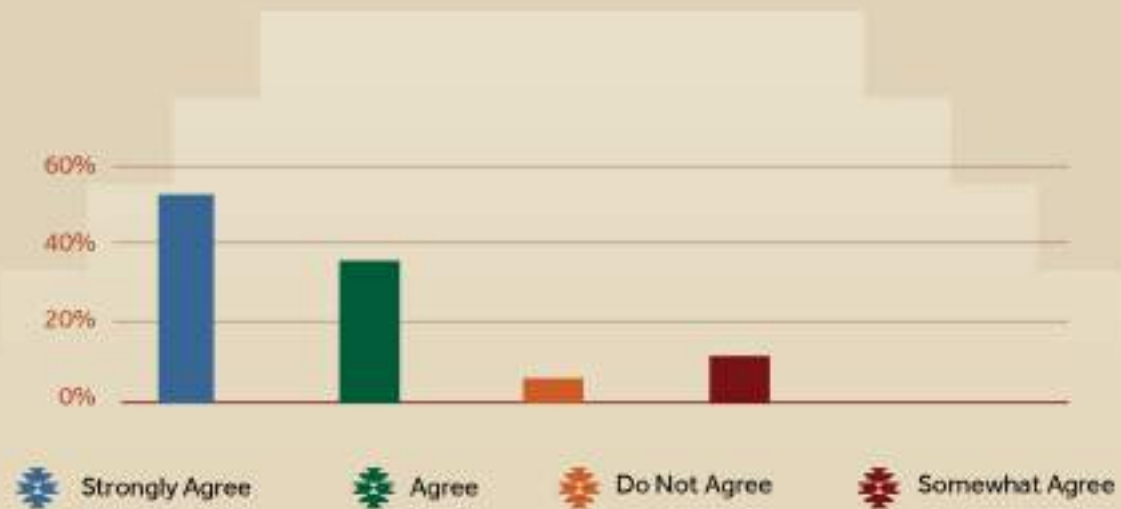
➤ The Camel Festival's contribution to stimulating tourism ➤



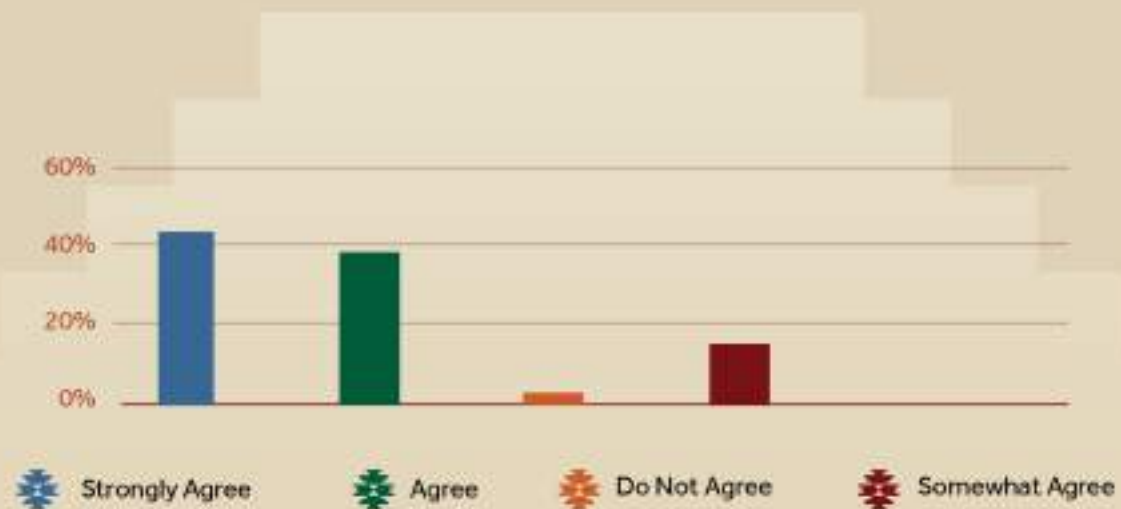
➤ Camel competitions are among the most attractive events for tourists ➤



➤ Heritage markets and exhibitions are among the most attractive events for tourists ➤



➤ Artistic and poetry performances are among the most attractive events for tourists ➤



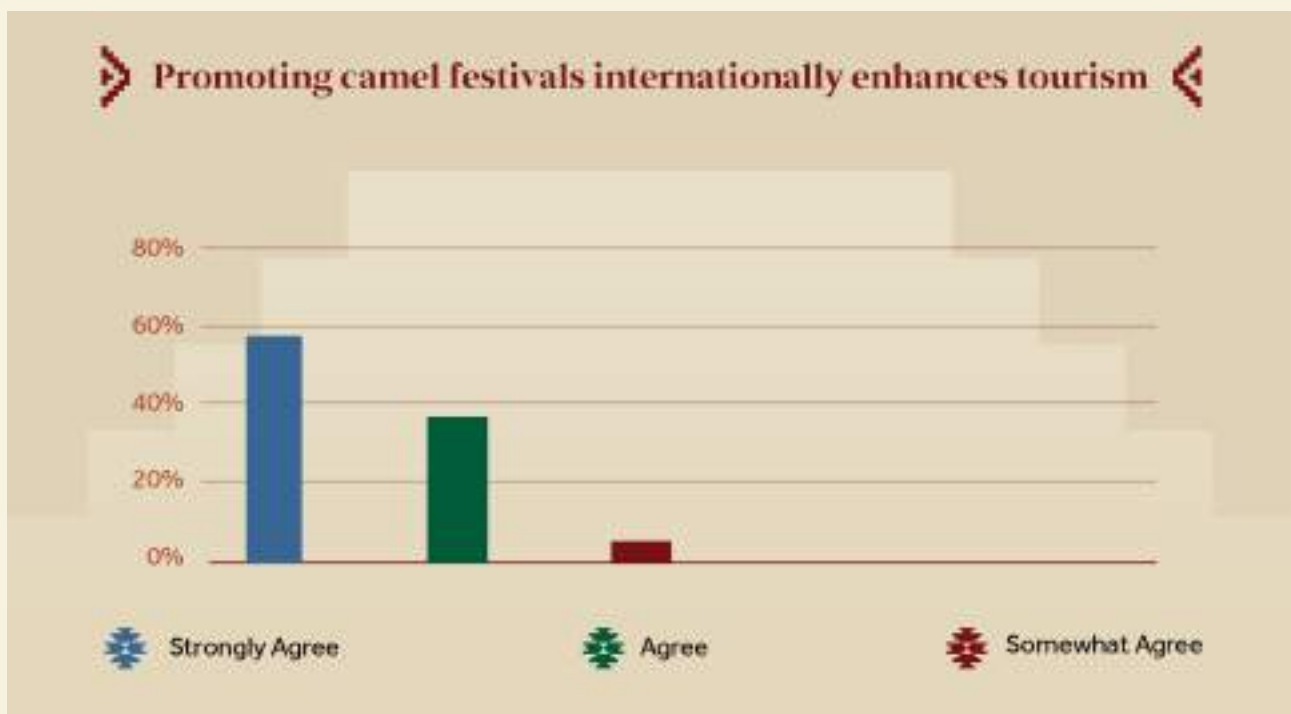
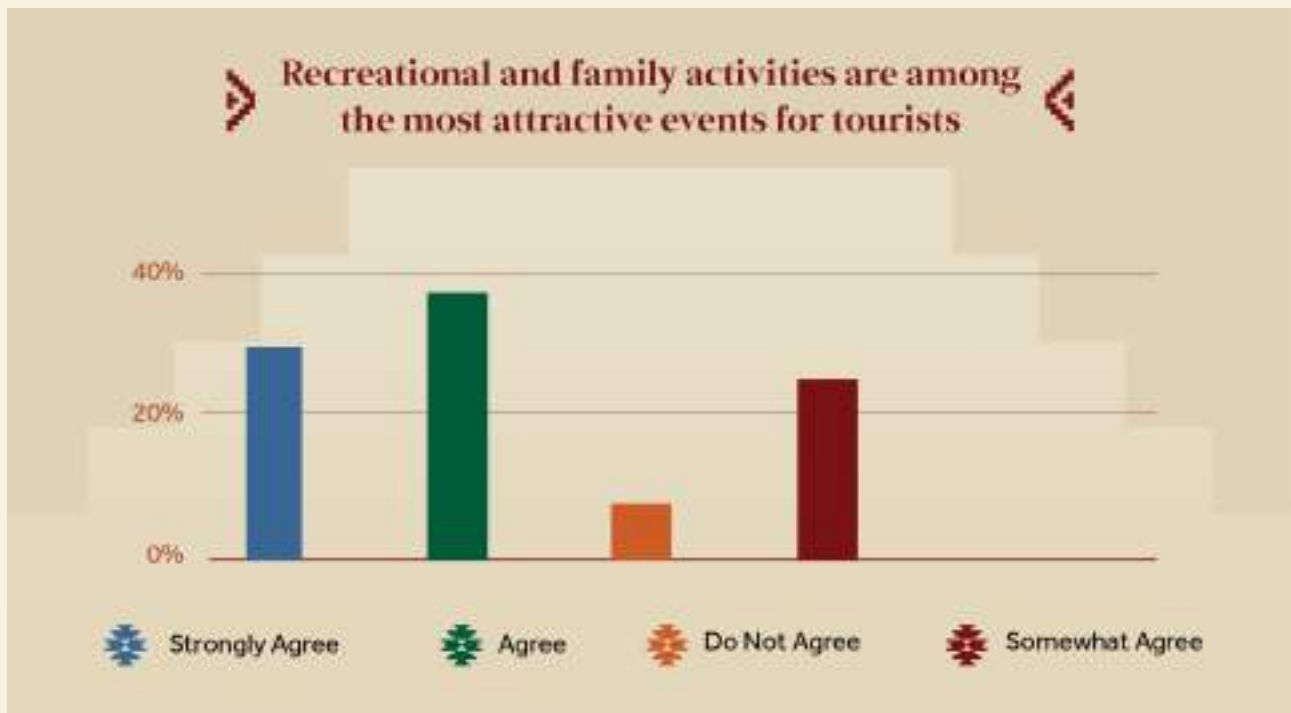


Figure No. (4). Impact of Camel Festivals on Tourism

Analysis of the Relative Importance Ranking of Main Survey Axes

Table No. 3 provides a statistical analysis to identify the relative importance of all elements constituting the three study axes (demand for goods and services, labor market, and tourism). The analysis indicates that the most direct and significant indirect economic impact of camel festivals, from the perspective of survey participants, is the increased demand for transportation and hospitality services, which achieved the highest arithmetic means (4.767 and 4.744, respectively). The festival's contribution to boosting tourism and developing skills within the camel sector also ranked highly. In contrast, the creation of new job opportunities and the increased demand for feed and supplies were considered the least important impacts by survey participants, despite still receiving positive ratings.

Rank	Item	Mean Score	Standard Deviation
1	Demand for transportation services and equipment increases during the Camel Festival.	4.767	0.422
2	Demand for hospitality and accommodation services increases during the Camel Festival.	4.744	0.436
3	The Camel Festival contributes to boosting tourism during the festival period.	4.674	0.468
4	The Camel Festival contributes to developing skills related to the camel sector.	4.627	0.483
5	Camel competitions are among the most attractive events for tourists during the festival.	4.581	0.493
6	Promoting camel festivals internationally enhances tourism in the Kingdom.	4.581	0.493
7	The Camel Festival contributes to improving business efficiency in the camel sector.	4.581	0.493
8	Traditional markets and heritage exhibitions are among the most attractive events for tourists.	4.441	0.725
9	The Camel Festival contributes to improving local income.	4.441	0.496
10	Artistic and poetic performances are among the most attractive events for tourists.	4.372	0.61
11	The Camel Festival contributes to job creation.	4.348	0.886
12	Demand for camel feed and supplies increases during the Camel Festival.	4.325	0.798
13	Entertainment and family activities are among the most attractive events for tourists.	4.162	0.744

Table No. (3). Ranking of All Elements

Results of the Analysis of Camel Milk Derivatives Consumption Patterns

Study Methodology

This cross-sectional exploratory study was based on a survey of consumers of camel milk derivatives. The study was conducted between September and October 2024 among adults in the Kingdom of Saudi Arabia. The target group included adults aged 18 and older, with a total of 224 participants recruited via a web link to an online questionnaire.

Data Collection Method

The questionnaire link was distributed using email invitations and social media platforms (LinkedIn™, Facebook™, and WhatsApp™). Participation was entirely voluntary, with no financial or non-financial incentives offered. An information sheet explaining the study's objective and protocol was presented on the first page of the online survey. The questionnaire was developed in Arabic using Google Forms and was reviewed by a committee of experts at King Faisal University. A pilot test was conducted with twenty-two individuals to ensure clarity, and necessary language adjustments were made. The study was conducted according to the guidelines stipulated in the Declaration of Helsinki, and all procedures were approved by the Research Ethics Committee at King Faisal University (KFU-REC/2024-ETHICS-2703).

Data Analysis Methods

The Statistical Package for the Social Sciences (SPSS) version 26.0 was used to analyze the collected data. A t-test was used to determine if there were significant differences between early and late responses; the results indicated no significant differences, confirming the reliability of the aggregated data.

Results

Demographic Results

A total of 230 participants completed the questionnaire. The socio-demographic characteristics of the study sample are shown in Table 1. The largest proportion of participants (70%) were between the ages of 17-25. A larger percentage of females (70%) completed the questionnaire compared to males (30%). Approximately half of the participants (50%) held a bachelor's degree. The majority of participants were married (68.7%) and employed (36.9%).



Table No. 1: Demographic Data for the Study Sample

Variable		Number (N=230)	Percentage
Gender	Male	69	30%
	Female	161	70%
Age	17-25	161	70%
	26-35	46	20%
	36-45	16	7%
	Older than 46	7	3%
Marital Status	Married	158	68.7%
	Single	72	31.3%
Educational Level	Postgraduate studies	50	21.7%
	Bachelor's degree	111	48.3%
	Intermediate/Secondary	69	30%
Employment Status	Student	80	34.8%
	Employed	85	36.9%
	Freelance/Self-employed	30	13%
	Retired	25	10.8%
	Unemployed	10	4.5%

Results of Camel Milk Derivatives Consumption Patterns

Approximately two-thirds of the participants (59.5%) reported having consumed camel milk at least once, and a quarter of them (25.1%) were regular consumers. Participants who reported consuming camel milk were asked to provide information about their consumption habits.

Product Preference: Consumers reported that they mostly consume fresh camel milk (45%), followed by fermented milk (25%), powdered milk (15%), and yogurt (15%), as shown in Figure 1.

Duration of Consumption: More than half of the participants (52%) mentioned they have been consuming camel milk for less than a year, while more than a third have been consuming its derivatives for less than 5 years, as shown in Figure 2.

Reasons for Consumption: Most consumers preferred camel milk derivatives over competing products because of their nutritional value (35%), followed by their medicinal properties (33%), and the belief that they are safer (25%). Better taste was the least cited reason (7%), as shown in Figure 4.

Source of Products: More than half of the consumers of camel milk derivatives (52.4%) purchase them from supermarkets, while others obtain them from family farms (31.7%) and neighboring farms (15.9%), as shown in Figure 3.

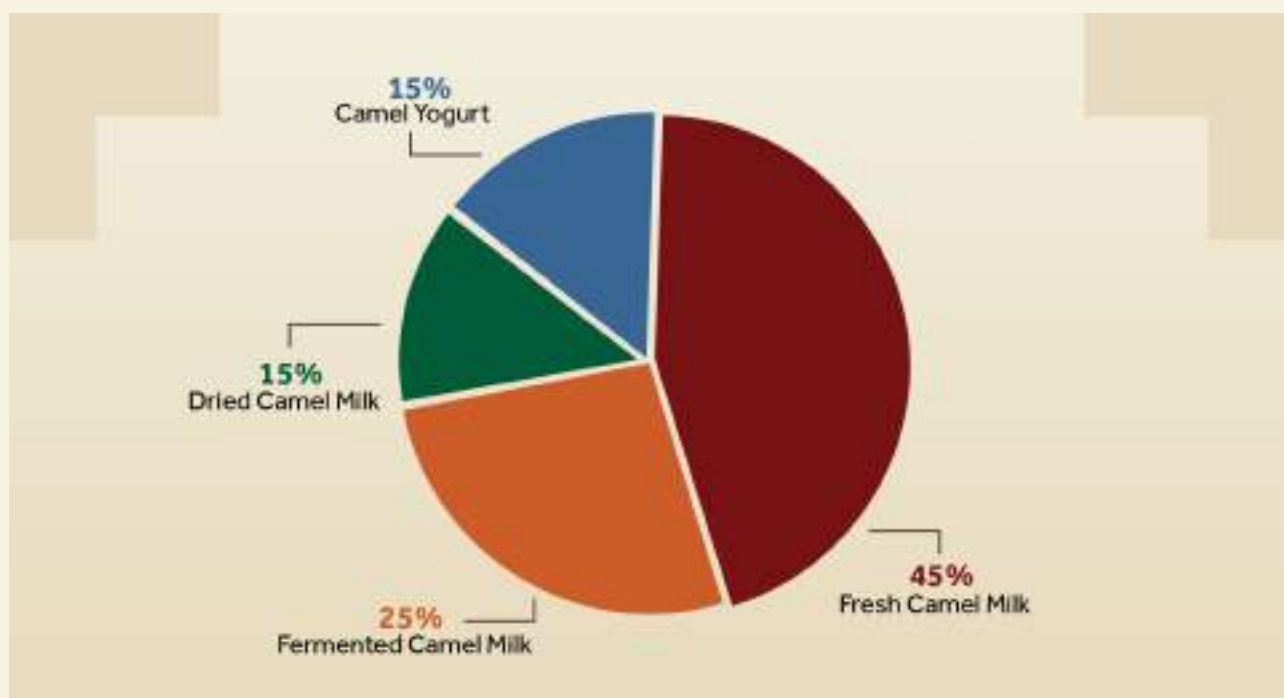


Figure 1: Consumption of Camel Dairy Products



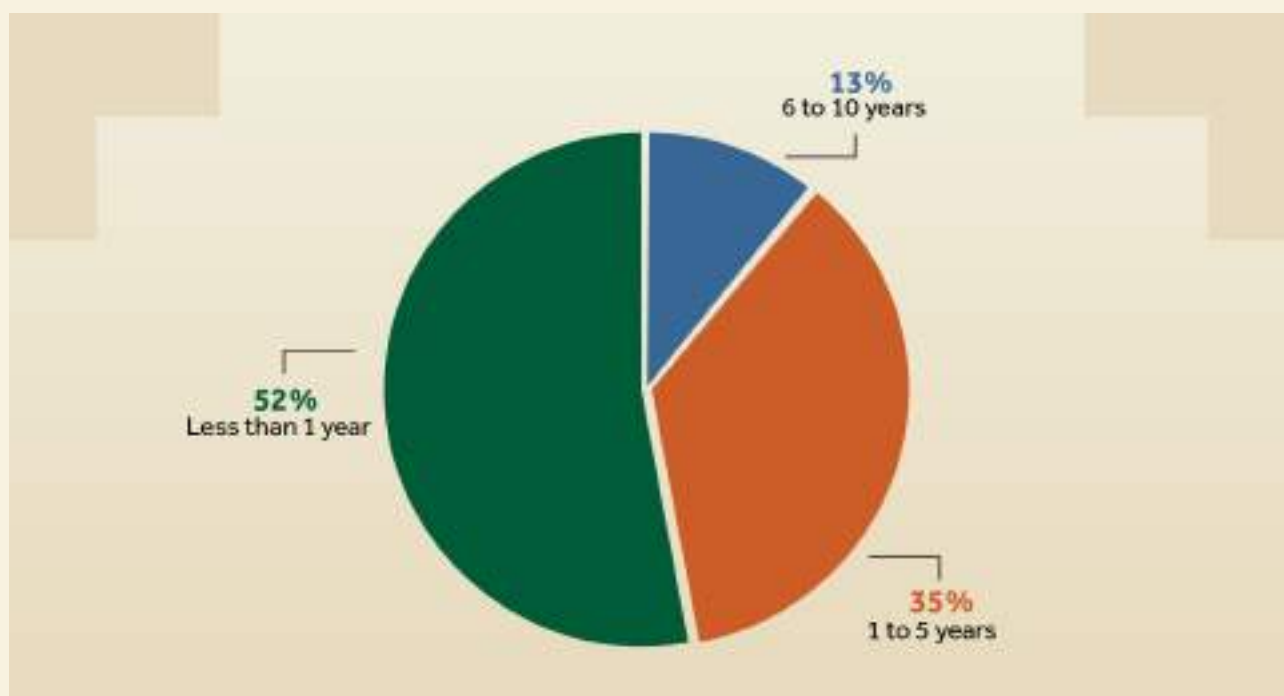


Figure 2: Number of Years Consuming Camel Milk Products



Figure 3: Purchase of Camel Milk Products

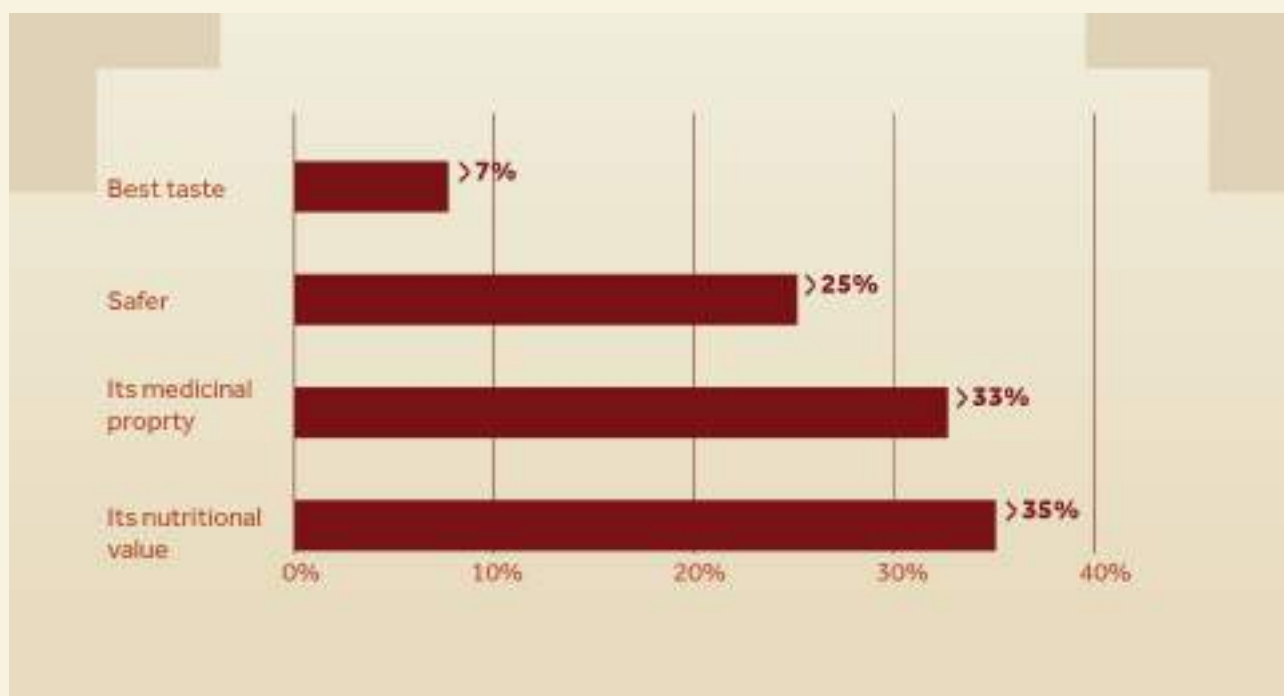


Figure 4: Reasons for Consuming Camel Milk Derivatives

Reasons for Not Consuming Camel Milk Derivatives

Participants who do not consume camel milk derivatives cited several reasons, including: insufficient available information about the benefits (40%), the belief that the taste is not good (21.7%), and the fact that the products are not easily available (15.6%).

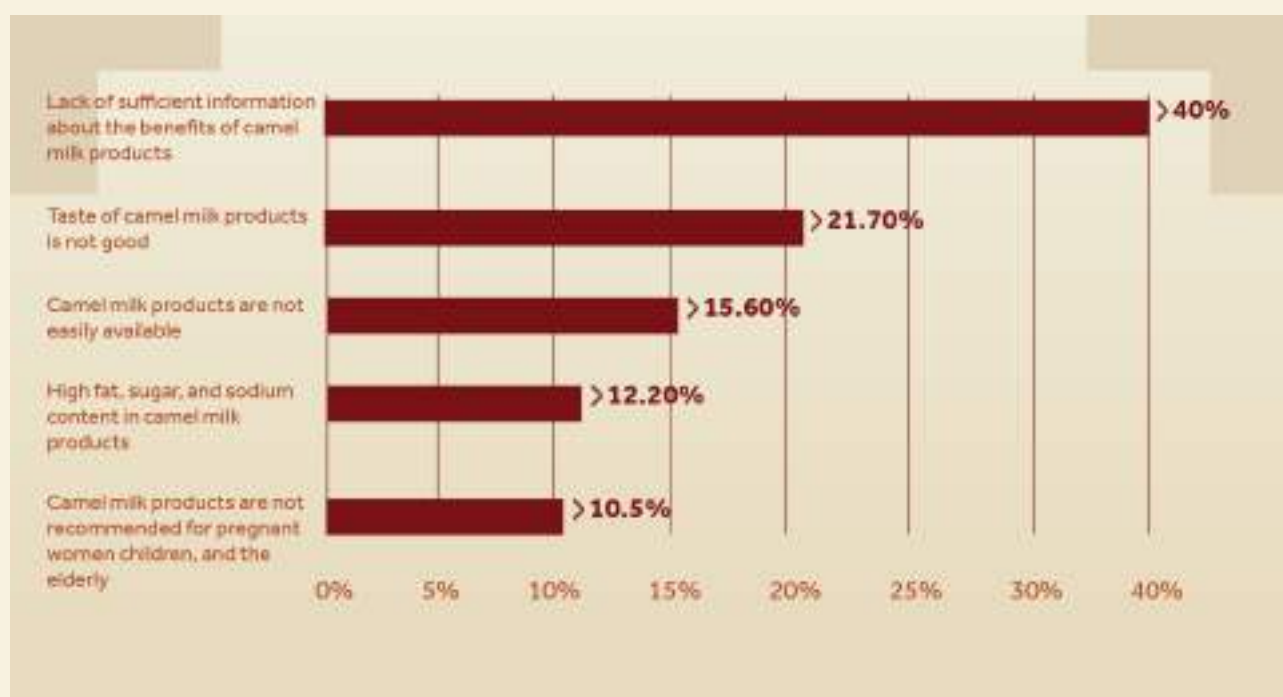


Figure 5: Reasons for Not Consuming Camel Milk Derivatives



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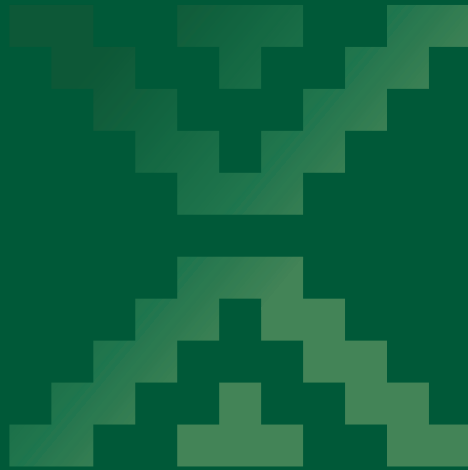


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