

The Multiple Uses of the Cannabis Plant and its Historical and Modern Development: An Analysis of Challenges and Opportunities

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Received: 16 Jan 2026; Accepted: 05 Mar 2026; Published: 17 Mar 2026

Citation: Iliass Bouhlal. The Multiple Uses of the Cannabis Plant and its Historical and Modern Development: An Analysis of Challenges and Opportunities. Int J Agriculture Technology. 2026; 6(1): 1-10.

ABSTRACT

Cannabis is one of the oldest plants that has accompanied the development of human civilizations, used for medicinal, nutritional, and industrial purposes across time and culture. Cultivation of this plant has occupied a special place in the northern regions of Morocco, contributing to the livelihood of many families despite environmental and legal challenges. With international shifts in cannabis legalization policies and global interest in sustainable development, the importance of reconsidering the plant's potential as an alternative economic resource has emerged.

This study examines the various uses of the Indian hemp plant and its evolution throughout history, starting with its culinary and industrial uses in ancient civilizations such as China and Egypt, and extending to innovative uses of the plant in sustainable construction, textile manufacturing, and pharmaceuticals. The study highlights practical examples such as houses made from hemp fibers, which represent a model of environmental sustainability, in addition to the industrial role of hemp fibers in the textile and rope industries. It also discusses the challenges and opportunities related to employing this plant in the pharmaceutical industry, whether for cosmetics or for treating certain chronic diseases, while highlighting the need to enhance scientific research to ensure its safe and effective use. The study concludes that proper exploitation of these potentials within an appropriate legal and environmental framework can effectively contribute to the development of the national economy in general, and to achieving economic and social development in areas licensed for the cultivation of Indian hemp in particular.

Keywords

Cannabis, Sustainable construction, Textile industry, Medicinal uses, Morocco.

Introduction

The world has recently witnessed a growing interest in plants with multiple uses, especially those that combine economic, environmental, and medicinal benefits. Among the most prominent of these plants is the Indian hemp plant, which has historically been associated with ancient civilizations such as the Chinese and Egyptians, where it was used to make paper, ropes, and medicines [1]. With the advancement of scientific research, innovative applications for this plant's fibers have emerged, particularly in

the fields of construction and pharmaceuticals, opening up new horizons for sustainable development.

Before the legalization of cannabis in Morocco, most researchers focusing on rural economic development avoided analyzing cannabis production, overlooking its role in community well-being, identity, and livelihoods [2]. Even in research on local products, cannabis production is rarely mentioned.

But after the issuance of Law No. 13.21 on July 14, 2021, regarding the legitimate uses of cannabis [3,4], researchers began to pay greater attention to this sector, not only from an economic perspective, but also in terms of its social, cultural,

and environmental impacts. Social and legal perceptions of this cultivation changed, sparking a shift in academic research, which now focuses on its development potential rather than being limited to its negative security or health aspects.

Thus, legalization has provided an opportunity to study the impact of cannabis on economic development, its contribution to job creation, and improved income for families in mountainous regions traditionally dependent on this cultivation. Research has also revealed the role of cannabis in preserving the cultural identity of local communities [5], as its cultivation is linked to customs and traditions passed down through generations.

Furthermore, legalization has opened the door to economic analyses that seek to transform this activity into a productive sector that can be used for medical and industrial purposes. However, challenges remain that require further research, such as the impact of legalization on prices, the extent to which small farmers benefit from the new law, and the impact of regulatory changes on the environment.

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environment.

In the context of the radical shift from traditional informal cultivation to a modern legal framework geared toward medical and industrial uses, the following problematic question arises: How can the historical and cultural legacy of cannabis cultivation be transformed into a resource that supports economic and social development under new legislation?

Study area

The study area, comprising the communes of Issaguen and Moulay Ahmed Cherif, is situated within the central Rif Mountains, part of the Rif Mountain chain. Administratively, these two communes fall under the jurisdiction of the Ketama district within the Al Hoceima Province, which itself belongs to the Tanger-Tetouan-Al Hoceima Region according to the new regional division of 2015. The studied communes are located in the western part of the province (Figure 1).

The communes of Issaguen and Moulay Ahmed Cherif are characterized by absolute elevations dominated by mountainous units, which cover more than 82% of their combined territory. This landscape is interspersed with a series of gullies and basins formed by water runoff, accounting for 7.5% of the area. Low-lying zones rank last, representing a modest proportion not exceeding 10% of the communes' total area.

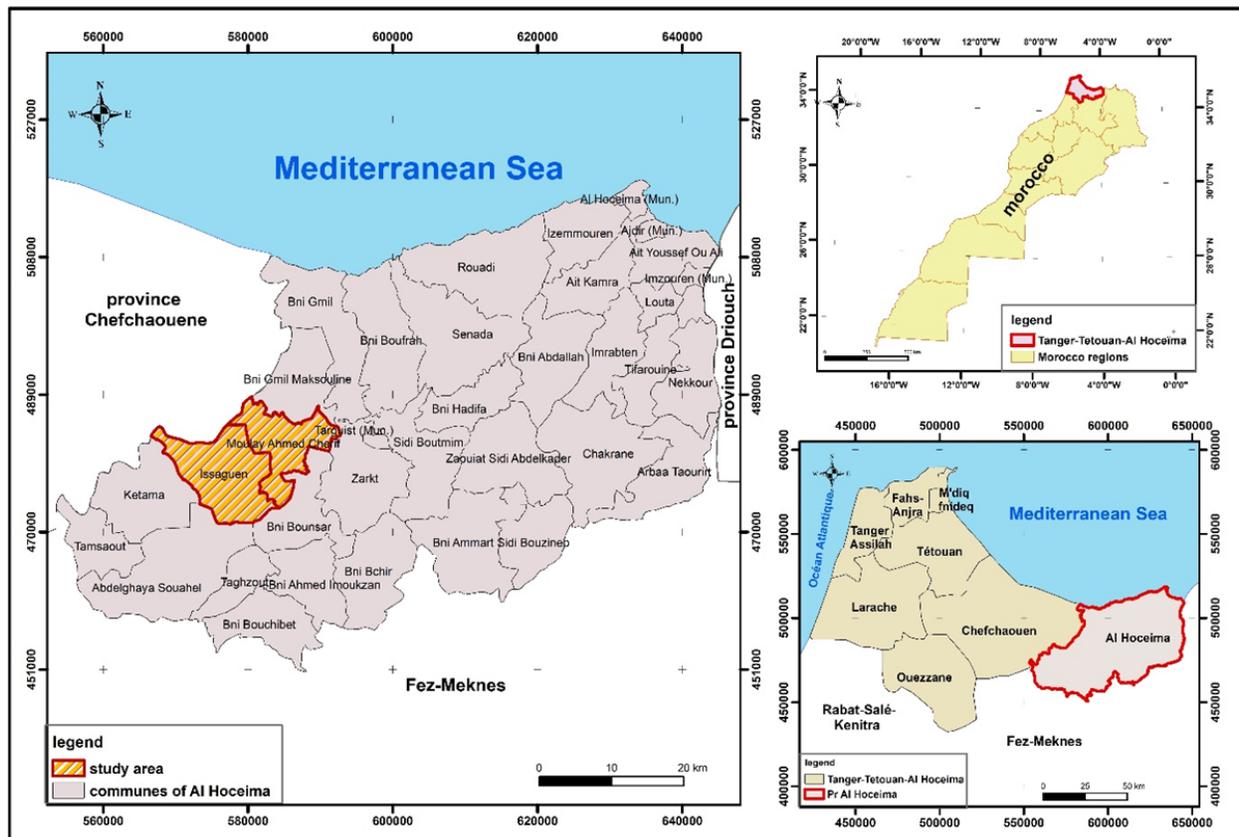


Figure 1: Localization of the study area in Central Rif Mountains northern Morocco.

Furthermore, it is situated in a mountainous region with elevations ranging from 600 meters to over 2000 meters, encompassing diverse topography of slopes and valleys.

The various uses of the cannabis plant and its development periods

The Chinese were the first to realize the nutritional value of cannabis. Its use later evolved into extracting thread from its branches, manufacturing paper and weapons, and preparing a range of medicinal drugs [6]. Hemp has been used for centuries to produce fibers suitable for weaving. It was also used in the manufacture of medicines to treat certain diseases in ancient Egypt [7]. The use of hemp fibers in the manufacture of ropes and cloth was an important activity in France in the fifth century [8].

The multifunctional hemp's abundance of beneficial ecological, agronomical, and pharmaceutical properties qualifies it as a useful raw material for a variety of conventional (fiber, food, oil, medicine) and advanced industrial products [9]. The aim of this review is to recognize hemp as a multipurpose plant that deserves its place in crop production systems.

Uses of hemp fibers in the construction field

The world today faces a major challenge in controlling energy consumption, as well as in reducing pollution and greenhouse gas emissions. In this context, the construction sector is the largest energy consumer (43%), ahead of the transportation, industry, and agriculture sectors, and produces approximately 25% of greenhouse gas emissions [10].

To mitigate these repercussions, the use of hemp fibers in home construction is an innovative solution in the field of sustainable construction. Industrial hemp is today a promising natural material thanks to its multiple environmental, economic, and social

properties [11]. Studies have proven that hemp has the ability to store carbon, offering sustainable solutions in the construction and industrial sectors, with the potential to create local jobs and stimulate economic development.

According to Suzanne, the hemp stem is made up of five distinct parts visible in (Figure 1):

- The epidermis, impermeable but regularly interrupted by openings called stomata. It is made up of a layer of cells with a cellulose wall;
- The cortex, which contains cortical fibers grouped into bundles;
- The wood, made up of parenchyma cells, fibers, and conductive bundles;
- The pith, made up of medullary parenchyma;
- hollow space.

Hemp fiber concrete is one of the most popular bio-based building materials in France [10]. Thanks to its heat, sound, and moisture insulation properties and light weight, it is environmentally friendly and an ideal choice for sustainable construction [12].

Some studies have shown that wet preservation of hemp not only improves the mechanical properties of concrete, but also facilitates fiber handling and reduces production costs [13]. This approach is also a sustainable and economical alternative to traditional treatments and can enable year-round use of hemp, regardless of climatic conditions [14].

In Morocco, amid legislative changes to legalize the legitimate uses of cannabis [5], increasing attention is turning to investing in this plant in the construction sector. It's worth noting that the use of non-industrial hemp has attracted considerable interest from researchers, who have conducted studies to evaluate the potential

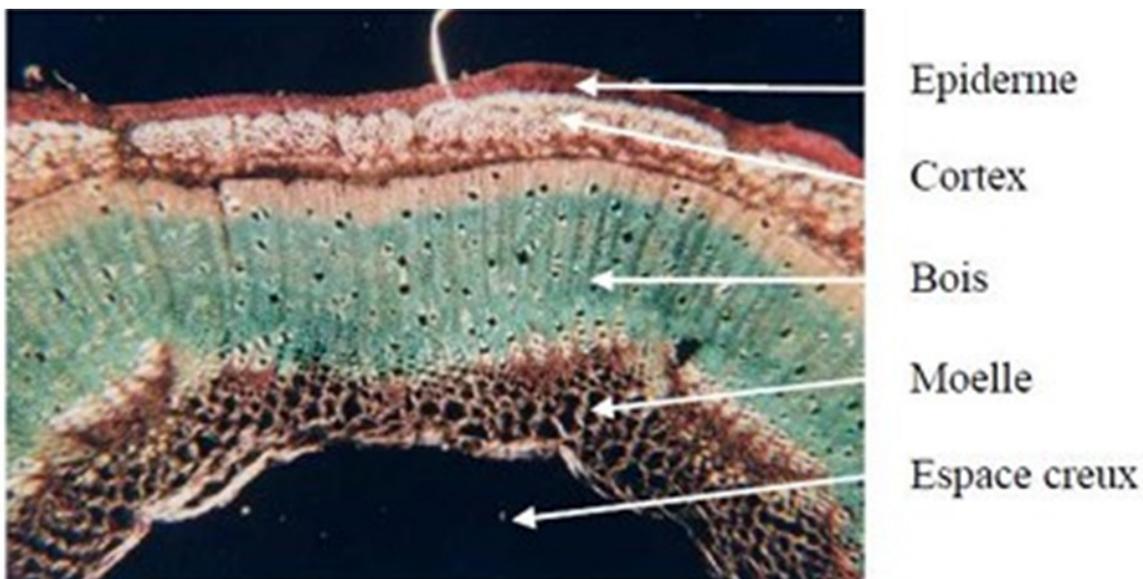


Figure 2: Micrographs of a cross-section of a hemp stem.

Source: Suzanne DAHER 2022: Optimisation de la formulation d'un béton de

use of Moroccan hemp fibers in home construction [15].

Figure 4 shows an eco-building house built in Morocco for the 2019 Global Solar Home Innovation Competition in Africa. The house was built with innovative, massive hemp walls, aiming to promote the use of Moroccan hemp fibers in the construction sector and create local jobs [16].

As a first attempt in areas where cannabis is cultivated, building bricks made from non-industrial hemp have been developed in Morocco [14]. German architect Monika Brümmer, an international expert in hemp construction, in partnership with the Adrar Nouh cooperative, built the first house made from hemp-based bricks in

the commune of Issaguen, in the province of Al Hoceima.

Figure 5 shows the crowdfunded construction of a rural house made from hand-crafted hemp fibers by Cannabric in the Issaguen commune. This is the first project of its kind in the region. This trend toward building "hemp brick houses" represents a new model for Morocco and the world, given its environmental sustainability and low cost. This initiative could bring about a positive transformation in the construction sector, given its fundamental role in preserving the environment.

Despite the significant benefits of hemp fibers in the construction sector, these fibers are not being exploited or valued in this context



Figure 3: Model of a house built with hemp fibers in France.

Source: Une maison en blocs de chanvre en Pays de Retz. <https://brico-ressources.fr/>

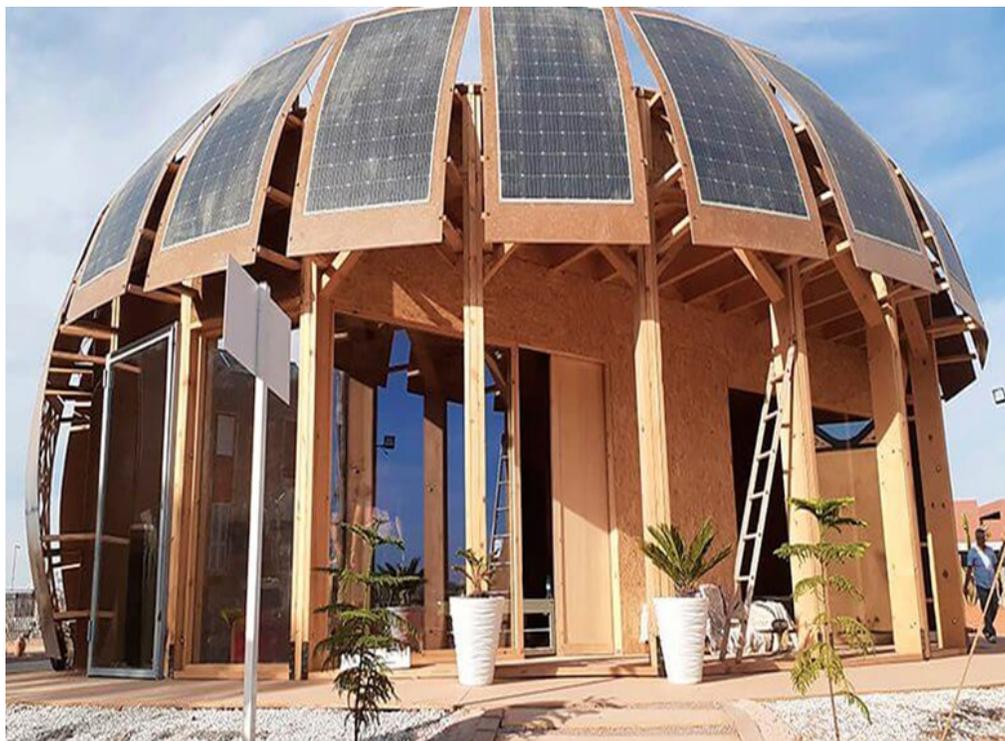


Figure 4: A revolutionary eco-building combines hemp and solar energy.

Source : Eco bâtiment « Sunimplant » (lieu: SGBP, Benguerir – Maroc)

[17]. Rather, they are considered organic waste, used mostly for domestic purposes in rural areas.

Uses of hemp fibers in the textile industry

In recent years, we have witnessed a renewed interest in hemp as a sustainable and versatile textile fiber in the fashion and textile industries [18]. This is due to its strength and low cost. Extracted from the outer layer of the stalks through combing and cleaning of resinous materials, the United States is one of the largest producers

of hemp fiber [19]. In order to support the acceptance of hemp as a fabric or accessory, several consumer companies, including Patagonia, Adidas, and other major networks, have incorporated hemp products in their line of products. Hemp fibers have many uses in the textile industry, and hemp fabrics have a wide range of uses, including clothing, jeans, sportswear, bags, hats, pillowcases, blankets, shoes, and socks. It is also used to make hemp jewelry, and other ornaments [20,21].



Figure 5: A crowdfunded rural cottage created with Cannabric handcrafted hemp blocks in rural Morocco. Photo courtesy of Cannabric and Coopérative Adrar Nouh.

Source: <https://www.hempbuildmag.com>



Figure 6: Textile products made from hemp in Morocco.

Source: Moroccan Biocannat Cooperative

In this context, functional clothing was made from pure hemp fibers enriched with cannabidiol (CBD) extract. The process relied on environmentally friendly techniques. About 15 volunteers participated in wearing these clothes for 6 weeks (12 hours per day). The volunteers noted the comfort and softness of the clothes, with no side effects such as redness or irritation [22].

Hemp fibers boast strong and durable properties, making them an ideal choice for the manufacture of high-quality clothing and textiles. They boast high resistance to abrasion and damage, as well as antibacterial properties and excellent breathability. Their aesthetic advantages include their natural texture and ability to be dyed in a variety of colors. Furthermore, hemp can be seamlessly combined with other natural fibers such as cotton, wool, and silk, enabling the design of innovative and unique blends that meet fashion demands [23].

While hemp is often associated with stereotypes, it's actually a little-known treasure in the world of textiles and clothing. For thousands of years, hemp has been used to create strong, durable, and versatile fabrics. Today, as the fashion and textile industries increasingly shift toward sustainable and eco-friendly practices, hemp is experiencing a resurgence.

Humanity has used hemp fibers to make fabrics, cordage, yarns,

carpets, and cloth for a very long time. To create a variety of materials suited for long-lasting and cozy apparel, the fibers can be spun, followed by weaving or knitting. Due to its strength and adaptability, hemp fiber was a widely used fabric for garments until the cotton industry became more established on a global scale [24]. However, hemp fiber is experiencing a resurgence today due to consumer awareness of sustainable environmental practices. Hemp cultivation is less water-intensive than cotton and requires fewer pesticides, making it an ideal choice for eco-friendly clothing and textiles.

Uses of cannabis in the pharmaceutical industry

Cannabis is one of the oldest plants from which humans have extracted medicines. The Chinese used it in the 15th century BC to treat rheumatic pain and as an antiviral [25]. Cannabis was considered a sacred herb by the Indians, considered an integral part of traditional Indian medicine. It was used as a sedative, pain reliever, anti-anxiety agent, and antibacterial [26]. The Egyptians used it 4,000 years ago to wash sore eyes. However, in the 20th century, the medicinal use of cannabis declined significantly, and its recreational use became more important.

However, despite the decline in the medical use of cannabis, the growing interest in patients over the past two decades has provided an opportunity to renew scientific interest in the medical use of



Figure 7: Medicines extracted from cannabis.

cannabis substances to treat a range of diseases, including cancer, depression, anxiety disorders, sleep disorders, and neurological disorders, etc [27].

In this context, France, through a specialized medical committee, has diagnosed a group of conditions that may be treated with medical cannabis. These include anxiety disorders, such as post-traumatic stress disorder (PTSD), depression, sleep disorders, chronic pain, neurological disorders, and inflammatory bowel diseases. Some patients with these conditions have reported improvement thanks to the use of medications containing cannabis [28,29].

There is also conclusive and substantial evidence of the effectiveness of medical cannabis in treating certain conditions, such as: an antiemetic and anti-nausea; improving spasticity and rigidity; increasing appetite and reducing weight loss; and improving symptoms of post-traumatic stress disorder [30]. In England, two medical cannabis drugs have been approved for the treatment of epilepsy and multiple sclerosis, both of which were developed in the United States.

While THC compounds address inflammation and pain, CBD compounds boost the body's immune system. In this regard, a study conducted by University College London showed that CBD can help reduce smoking, revealing that 40% of study participants reduced their cigarette consumption when they received a dose of CBD delivered via an inhaler [31].

Among the medications recently manufactured in Morocco are: Gélules CBD MÉLATONINE a dietary supplement containing a combination of cannabidiol (cannabis) and melatonin, which helps you sleep and relieves anxiety and stress, and the Gélules CBD ENERGIE, which helps improve cognitive and physical performance. This is in addition to various types of cosmetics. These products are manufactured by the Moroccan company cannaflex.

Overall, the need for new treatment options is unquestionable, and it's reassuring to see these medications extracted from the local cannabis plant, abundant in our country. This will contribute to the development of the pharmaceutical industry and ensure self-sufficiency in medications for some diseases. It will also boost production, allowing for export to various countries, bringing in hard currency for the country, and improving the standard of living of the people of the land of kif.

Uses of hemp in the food industry

The cannabis formula includes a group of ingredients, such as cannabidiol, which is used in nutritional supplements. Hemp seeds are also rich in fatty acids and proteins, making them a healthy food [13].

In this context, several cooperatives have begun producing food products derived from the cannabis plant, reflecting the recent evolution in the utilization of this plant within the food industry. First, there is edible hemp oil, which is extracted from the plant's



Figure 8: Food products extracted from cannabis in Morocco.

seeds and is a rich source of essential fatty acids, making it a healthy alternative to conventional oils. Second, there is hemp cake, which demonstrates the incorporation of seed powder into baked goods, adding a high nutritional value of protein and fiber. Third, there is hemp flour crepe, which highlights the use of plant-derived flour in everyday recipes, as a healthy alternative to wheat flour. Finally, there is hemp honey.

These products demonstrate how hemp can be transformed from a controversial plant into a food resource with health and economic benefits, especially in light of the global trend toward functional and sustainable foods. However, popularizing these products requires awareness campaigns to correct stereotypes about hemp, and strict controls to avoid any confusion between food and recreational uses.

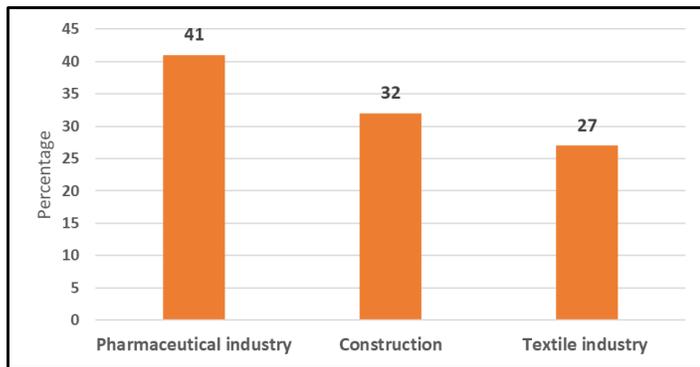


Figure 9: The industrial uses of cannabis most prominently featured in the minds of research participants.

Source: Field research 2025

The study results showed that the industrial uses of cannabis most prominent and influential in the minds of the respondents were the pharmaceutical industry, which ranked first with 41%, followed by construction-related uses with 32%, and the textile industry ranked last with 27%.

In this context, respondents were asked about their opinion on the economic feasibility of legalizing cannabis production in the construction, industrial, and medical sectors. Participants were unanimously positive about this transition, believing it has promising economic potential, provided it is accompanied by a robust regulatory framework to control the exploitation of this substance and avoid any potential negative repercussions.

The study also confirmed that cannabis occupies a central place in the lives of rural residents in northern Morocco, both as a source of livelihood and as a cultural heritage [33]. Therefore, enhancing its value could enhance its legitimate uses and reduce the social and economic injustice faced by farmers, especially if the state supports the diverse medical and industrial uses of cannabis.

It's clear that these industrial uses are firmly entrenched in the minds of respondents, perhaps due to the growing global interest

in the green economy and sustainable materials. Many expressed hope that the coming years will witness an expansion in investment in these industries, which will contribute to achieving sustainable development and creating new job opportunities across various sectors.

The Impact of Cannabis Legalization on Local Cannabis Strains in Morocco: An Objective Analysis

It's worth noting that Morocco has a rich agricultural heritage in cannabis cultivation (traditional kif), with the Rif region famous for its local strain. This strain has adapted to local climatic conditions over centuries and provides a source of livelihood for thousands of farming families.

As Morocco experiences a growing debate over cannabis legalization, which could spur investment in high-quality hybrid strains, it raises concerns about the marginalization of traditional varieties (known locally as "baldia").

Legalizing medical cannabis in Morocco may encourage the use of non-native varieties, impacting traditional breeds. Global competition is thus pushing farmers to adopt higher-yielding varieties that are less adapted to the local environment [32]. In this context, focusing on foreign breeds may lead to: a decrease in the value of local breeds; marginalization of traditional farmers; and the loss of traditional agricultural knowledge.

The legalization of medical cannabis in Morocco represents a shift that could lead to the spread of imported varieties at the expense of traditional local strains. Global market demands are pushing farmers to adopt high-yielding varieties, despite their limited adaptation to local environmental conditions. In this regard, it can be said that "the countryside without local cannabis would not be the countryside itself," as this cultivation reflects not only an economic model but also a cultural heritage and an integral part of the region's social fabric.

The legalization of cannabis in Morocco poses an existential challenge to the local strain, but it could also represent a historic opportunity to enhance this agricultural heritage. Successfully balancing modernity and authenticity requires smart policies that combine support for traditional farmers with the exploitation of economic opportunities. This requires a strategic vision that considers the local strain a national asset, not just an agricultural product, while establishing practical mechanisms to preserve and develop it under the new regime.

Agricultural Constraints for Industrial and Medical Cannabis Production in the Study Area: Between Poorly Irrigated Land and Degraded Soil Quality

The successful implementation of the cannabis legalization project requires several fundamental prerequisites, including fertile soil, land equipped with irrigation systems, and suitable hydraulic infrastructure. However, the actual situation in the study area reveals a significant deficiency in these requirements. Data indicates that cultivable land constitutes no more than 37.8%

of the total area of the two communes, with rainfed agriculture dominating at 78%. Furthermore, the soil suffers from low fertility, limiting its capacity to produce high-quality hybrid seed crops.

Regarding irrigation, the mountainous nature of the area and its steep topography pose a major obstacle to the installation of modern irrigation systems. In light of these findings, it can be concluded that the production of industrial and medical cannabis in these two communes will face substantial challenges that adversely impact its economic viability. Consequently, other regions better endowed with these prerequisites – such as Taounate and Chefchaouen – are better positioned to benefit more substantially from this project.

Conclusion

This research demonstrates that cannabis represents a multifaceted resource, combining historical and modern value in sustainable construction, the textile industry, and medicinal and food uses. Despite the legal and social challenges this plant has faced, global shifts toward a green economy and sustainable development require a re-evaluation of its potential as a promising economic and environmental alternative. In Morocco, where cannabis is an integral part of agricultural heritage and local identity, its legalization could open new horizons for economic development, provided it is accompanied by a regulatory framework that preserves the rights of traditional farmers and ensures the optimal exploitation of local varieties. Investment in scientific research and industrial innovation will maximize the economic and medicinal benefits of this plant, while preserving its environmental and social balance.

Cannabis stands out as a versatile plant, combining historical values with contemporary benefits in multiple fields. Recent Moroccan experiences in sustainable construction, textile, and pharmaceutical industries demonstrate that the proper exploitation of this plant within a regulated and sustainable framework can contribute significantly to local economic development and improving the living conditions of the population. Accordingly, cannabis-based industries should be integrated into national development policies, and scientific research and innovation should be encouraged to ensure the sustainability of this resource and maximize its economic, social, and environmental benefits.

Ultimately, successful use of cannabis as a strategic crop requires integrated policies that combine economic modernization, cultural heritage preservation, and social justice for local communities that have been associated with its cultivation for centuries.

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