

A Brief Review of the Impacts of Medical Cannabis Production

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Abstract

Introduction: Cannabis has recently gained a medical status in several countries in the world. Its production for medical purposes should be analysed based on the three pillars of sustainability, taking into account the country in which it is located.

Methods: literary research was conducted through scientific databases and grey literature, such as institutional websites.

Results: Studies from the United States of America and Australia on the socio-economic and environmental impacts of medical cannabis production were consulted, showing that this crop can be socially and economically beneficial in the place where it is executed but, in environmental terms, there is still a long way to go to understand the impacts on the consumption of energy, water, pesticides, fertilizers and waste waters compliance.

Conclusions: The introduction of new non-autochthonous species should be accompanied by studies assessing their impact on the production site. The production of medical cannabis has been increasing and it is imperative to study its impacts in order to be able to implement measures to mitigate potential negative effects.

Keywords: Sustainability, Medical Cannabis production, Production Impacts

Introduction

Cannabis has been used for thousands of years for several applications and, in particular, for its pharmacological effects. For decades it was present in most countries' pharmacopeias for nausea, pain and seizure management and was used as a medicine until the 20th century when it was considered a controlled substance with lack of safety regarding medicinal use, high potential for abuse and dependence [1].

In the beginning of the 21st century, many countries changed their laws to allow the medical use of cannabis due to scientific progress, specifically with the discovery of the endocannabinoid system and the isolation of the main compounds of cannabis [2]. The countries that legalized the consumption of medical cannabis have drafted specific laws on their prescription, sale and use and also on their production and transport in the national territory.

Scientific studies consider that cannabis was originally from Asia and that, from there, it was domesticated and disseminated around

the world due to its versatility in terms of adaptation to the climate and in terms of potential uses [3, 4]. It is important to understand whether the exponential growth of medical cannabis production in several Western countries that have already legalized its use and production is sustainable given that in many of these countries the plant is not endemic.

Methods

This mini review was carried out through research in scientific databases in search of articles that mentioned "sustainability of medical cannabis production" and also through the research of grey literature, as official websites of world organizations or legislation of countries that have legalized the use and production of medical cannabis.

Results

Based on the experience of countries that already studied this, the social, economic and environmental impacts of this crop vary depending on production system, location and other features.

A significant part of the companies authorized to produce cannabis have their facilities for cultivation in rural or industrial areas of the respective countries. In order to verify the social impacts of the production of this plant in rural areas, Kelly and Formosa (2020) carried out a study on the northern coast of California. Their results suggested that, on the one hand, the introduction of this production was beneficial for job creation and for securing high qualified employees in rural areas, reducing the migration of the young population (that were already used to the agricultural environment) to urban areas. On the other hand, former owners of farms in the County that disputed the use of land with each other, put their differences aside to join in the dispute for land against the new cannabis producers [5]. Although this study concludes that the introduction of these new productions can lead to development of rural areas with updates to road systems, increase in employment and population, also leading to new environmental assessments, the authors believe that the regulatory framework could be restructured to allow small producers (and not just large pharmaceutical groups) to be able to meet all legal requirements imposed for production and distribution, helping to combat inequalities in the future [5].

Also at the level of social impacts, a report produced by the Colorado Institute of Cannabis Research, on the impacts caused by the legalization and establishment of cannabis production companies in Pueblo County (USA) from 2012 (the year it was legalized) until the year 2016 addressed several social dimensions [6]. The report is extensive and although Colorado (USA) legalized medicinal use as well as recreational use, some aspects highlighted therein are of great importance and can be extrapolated to other countries.

Among the impacts studied in the USA case, the high investments in the production of cannabis in the county and the creation of new jobs in the area did not have significant impact on poverty rates. The authors also mentioned the fact that family incomes in Pueblo County have not increased, even though the cultivation of this plant is one of the most profitable in the world, a consequence, perhaps, of the recent introduction of legislation that has not yet had any economic effects on families, and which, according to the authors, will certainly be observed in the future [6].

This report also addresses other broad economic impacts generated by the cannabis industry, mentioning general benefits such as tax collection and job creation and other impacts such as real estate inflation and new business and commercial construction. It also points out the beneficial impacts of people working in cannabis companies spending their income on local trade, extending the impact to local businesses and the fact that taxes generated by this industry are reinvested in the designated area, stimulating the economy. It should be noted that taxes on the cannabis industry and retail have shown a significant increase over the years, al-

though it is important to consider that, in this case, the recreational use of cannabis has a big influence [6].

As mentioned before, cannabis is an endemic species of Asia and, although it has been cultivated for years in different countries around the world, the need to understand its environmental impact is imperative. In terms of environmental impact, Ashworth and Vizueté (2017) briefly summarized environmental concerns with cannabis production, invoking the excessive need for water and energy and the potential for contamination of water, soil and air with waste materials and with chemical and organic pollutants [7].

A study published in 2012 aimed to assess the carbon footprint, using Life Cycle Assessment (LCA), of indoor cannabis production in California and the impacts of energy consumption both on the environment and economically. They concluded that the energy needs for indoor production produced about 4 600Kg of carbon dioxide per kilo of plant (considering its entire lifetime) and also generated other problems such as the increase in the probability of electrical fires and economic constraints with the increase that has been observed in the price of energy [8].

From the perspective of outdoor cultivation, a study also carried out in California found that rates of water extraction from this crops threatened aquatic ecosystems streams and that water effluent near the production contained high levels of fertilizers and pesticides like herbicides and fungicides, further damaging aquatic wildlife and putting in danger the biodiversity [9]. These aspects, however, are typically excluded from the impact pathways used to model the fate of pollutants in LCA.

In Australia, the cultivation of cannabis for medical purposes was legislated in 2016 and, in 2021, a study analyzed the implementation of this industry in the country [10]. This study revealed that Australian environmental conditions are conducive to outdoor cannabis cultivation, allowing one or two annual growth cycles. However, the restrictive laws regulating the safety of this production lead to the expectation that producers are more likely to grow indoors. In both cases, the limiting factors for this production are the presence of water and light, and the prices of these resources can be prohibitive for small companies or start-ups to take risks in this business [10]. This study also affirms the importance of assessing sustainability in an industry or market during its first years of implementation in order to identify the possible impacts it can bring and give a broader view to understand whether it is adequate and viable in economic conditions, social and environmental issues in which it will be implemented [10].

Conclusions

Understanding the sustainability of production is inseparable from its social, economic and environmental impacts. It is also inseparable from the place, culture, country law, landscape and many

other factors. The studies and reports presented in this document, allied to the growing interest of companies producing medicinal cannabis in several countries, demonstrate the importance of creating methodologies that measure impacts, translating them into measures of production sustainability.

Thus, the problem identified justifies the relevance of carrying out this work is the lack of evaluation on the sustainability of the production of cannabis for medicinal purposes in the locations it's implemented. As the market is still in early stages of development in some countries (like Portugal), it is critical at this moment to assess expected impacts from cannabis production in the country to highlight the main challenges and propose course-correcting measures if necessary.

This problem should be addressed in a multidisciplinary construction through the critical analysis of the countries' law in the three aspects of sustainability in order to assess the impacts of this production and with the intention of mitigating negative impacts and potentiating positive impacts.

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