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THE ISSUE OF INDUSTRIAL SURVIVAL: THE CASE OF HEMP IN THE TEXTILE SECTOR

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Abstract: *In an era marked by ecological degradation, resource scarcity, and the urgent need for sustainable industrial practices, the textile sector faces a critical question of survival. Hemp (Cannabis sativa L.), a historically significant yet long-neglected fiber crop, is re-emerging as a viable solution to many of the challenges confronting modern textile manufacturing. This paper examines hemp not only as a sustainable raw material but as a symbol of industrial resilience. Its low environmental footprint, high biomass yield, and minimal input requirements position hemp as a strategic alternative to resource-intensive crops like cotton. Furthermore, hemp fibers possess intrinsic qualities—durability, biodegradability,—that align with the demands of a circular economy. The research highlights recent global and regional shifts in policy, investment, and consumer interest that are redefining hemp's role in textile production. Particular attention is paid to the constraints of processing infrastructure, regulatory ambiguity, and market adaptation, which continue to hinder widespread adoption. Ultimately, this study frames hemp as a litmus test for the textile industry's ability to evolve under pressure and to prioritize long-term ecological and economic survival over short-term gains. This paper explores the potential of hemp as a sustainable textile fiber, highlights recent industrial developments, and evaluates the challenges related to its cultivation, processing, and regulatory environment—particularly in emerging markets such as Turkey, where renewed interest and investment are on the rise.*

Key words: *Sustainability, Industrial Hemp, Textiles, Hemp Seeds, Fibers*

1. INTRODUCTION

"Design, Production and Branding" with its technical, economic, aesthetic and social aspects are the main concerns of today's societies as a whole. Land wars have given way to the optimum use of existing land and resources. Considering all polluting factors, especially the protection of water, soil and air, a new production process, the "Green Industrial Revolution" based on "Sustainability and Circular Economy" has begun. "Sustainability of Humanity" depends on agricultural and industrial production. Human activities on earth are under increasing pressure due to limited material resources and environmental problems. After the Industrial Revolution, factors such as excessive use of resources, accumulation of waste, uncontrolled gas emissions to the ecological system and the decrease in drinking water, which cause "unsustainable" results with traditional methods in all

industries, have emerged. At this point, industrial hemp has begun to attract the attention of the whole world as an environmentally friendly raw material.

First of all, it should be noted that hemp / hemp (Cannabis) is divided into 3 main species, Cannabis sativa, Cannabis indica and Cannabis ruderalis. These species have different physical and chemical properties. In this article, Cannabis sativa, which has no narcotic problems and is produced with certified seeds, will be discussed in general terms. Since this type of hemp contains less than 0.3% tetrahydrocannabinol (THC), it cannot be converted into cannabis / recreational substance by any chemical or mechanical method. Industrial hemp farming is no different from agricultural products such as corn, wheat, barley, sugar beet. In fact, banning industrial hemp farming is no different from banning the planting of basic textile fibers such as cotton and linen. The hemp industry can develop without any risk with the active implementation of controlled planting legislation and the use of certified seeds. When international reports are examined, no relationship has been found between the development of the industrial hemp sector and cannabis use. On the contrary, this year the United Nations (UN) [1] Commission on Narcotic Drugs decided to reclassify cannabis, removing it from the list of the most dangerous drugs such as heroin and synthetic pills. Although this does not mean that cannabis is free, it shows that the image of cannabis is changing on a global scale. It should be noted again that cannabis plants produced for cannabis purposes and industrial hemp plants are completely different plant species. It is possible for the cannabis sector to develop rapidly in Türkiye as a result of the establishment of interdisciplinary commissions and expert boards and their coordinated work with law enforcement to eliminate possible abuses in different countries [2].

Fig. 1. *First Developed Turkish Hemp Seeds Plant*

2. GENERAL INFORMATION

2.1 Raw Material 4.0 - Are We Ready for the Raw Material Revolution?

Industry 4.0, robot-based production, dark factory, big data, automation methods, production technologies have reached unbelievable dimensions in the last 50 years. It has become almost impossible to supply raw materials and to keep up with the pace of production technologies and consumption. Inventions such as steam, electricity and basic machine elements in the industrial revolution have transformed into advanced robotic manufacturing systems today, and subsequently, it has become necessary to move to a new era that we can define as the "Raw Material Revolution" in fast production technologies. Raw material is, in its most general definition, "the basic unprocessed structure used in the production of a product". For example, "The raw material of paper is cellulose." Cellulose is one of the most important natural polymers used in manufacturing after synthetic petrochemical raw materials. The hemp plant has a serious potential among renewable and environmentally friendly cellulose sources compared to petroleum derivatives. Hemp is the only plant that can simultaneously provide solutions to the recently discussed resource scarcity, depletion of wood stock and environmental problems. While water wars, oil wars, brand wars, production and customer wastes have gained value and a new era that we can generally call "Garbage / Waste Wars" has begun. While developed countries used to dispose of their wastes such as used clothes, shoes, packages, bottles by transporting them to developing countries, these wastes have now become an important source of raw materials. In order not to lose resources, each country is trying to recover its own wastes and this process is being carried to industrial dimensions. At this point, the European Union countries have a broad consensus on supporting recovery and recycling projects. There can be no production without raw materials and no competition without production [3].

Image 2. From land to factory sustainable fibers

2.2 The Birth of the New Plastic - What is Hemp?

Despite increasing academic studies and its popularity in different sectors, the hemp industry needs comprehensive R&D studies on the most basic issues such as seed breeding, ecological compatibility, and harvesting technologies. It is expected that hemp will become widespread by going through similar processes, just as plastic R&D / P&D became widespread after the discovery and processing of crude oil and an unlimited plastic product range was created today. It is among the trends that hemp will take its place in daily life much faster than plastic due to its

renewable and environmentally friendly nature compared to oil. Making hemp farming efficient and feasible will accelerate hemp-based sectors. The ability of hemp to enter mass production as a raw material depends on sufficient agricultural organization and planting in large plots. At this point, obtaining and processing a sustainable cellulose source, which is new to the whole world, leads to an innovation-based competition start and system transformation in the industry. In fact, aside from the application of medical hemp, the industrial hemp sector has started to develop almost simultaneously all over the world, except for China. Textile based countries has also a high potential to be a pioneer in this developing sector. In today's world where the oil status quo is being questioned and alternative sustainable structures are in demand, it is quite possible for Türkiye to embrace hemp wholeheartedly and become a leader in the global market by selecting products suitable for our infrastructure and industry. Both the final product and the technology and systems used during the production of that product can be easily developed in our country. In addition to the export of the final product, machinery and technology exports are also possible with hemp.

Fig. 3: Hemp based samples developed by author [4].

2.3 Benefits of Hemp Production

- Its rapid growth and high biomass (cellulose) per acre are the most important solutions to the "raw material crisis" as this structure can be used in countless sectors.
- It is an environmentally friendly raw material at every stage of the process from seed to final product, compared to production methods that cause environmental pollution. It has been proven in the light of scientific data that it improves the soil and air during production.
- Sustainable solutions can be provided with hemp-based structures to sectors at the top of the hierarchy of needs such as clothing, shoes, food and shelter.
- As a result of global deforestation (due to industry, disasters and population), afforestation and forest restoration have become necessary. Hemp offers a very quick solution to this problem.
- It has successful applications for “cleaning the soil and increasing its fertility” as it can remediate contaminated soils through phytoremediation and can be cultivated without

pesticides.

- It is a plant that can offer an alternative to farmers in places where cultivation is difficult or as a rotational crop, thanks to its ability to grow in very different geographical conditions without being affected by external factors such as rodents, fungi and weeds.
- The textile and ready-to-wear sector depends on polyester and cotton fibers. Polyester fiber is a petrochemical-based synthetic structure. Cotton, on the other hand, is not ecological due to the fact that it pollutes the field during production, low productivity per acre, delicate production, and chemical maintenance requirements. Polyester and cotton meet approximately 90% of all fiber consumption. Hemp has the potential to be a third fiber in these consumption amounts.
- Hemp fiber production requires fewer workers and processes than other fibers, which is an important advantage for sustainability during production.

Image 4: Turkish seeds-based fiber and oil

2.4 Key issues regarding Industrial Hemp

- **There is a risk that hemp may turn into hashish, heroin and marijuana!** Cannabis, like all plants, has a large family and has been produced throughout history as a source of herbal raw materials or as a recreational substance. The classification of this ancient plant as only a narcotic is a serious perspective problem. While Cannabis indica, Cannabis sativa and Cannabis ruderalis could be separated very easily and clearly even before science and technology, in today's information age, it is possible to provide controlled production of hemp (Cannabis sativa) as a source of herbal raw materials only.
- **Are there hemp seeds suitable for different countries like Turkish soil?** Contrary to popular belief, Türkiye has historically hosted high-tonnage hemp cultivation as a hemp production center. Hemp cultivation was practiced in the vast majority of our country, especially in the provinces where it was permitted, until a generation or two ago. In fact, during the examinations, seeds collected from different regions were improved and certified under the names of “Vezir” and “Narlı”. In addition to these, new seed improvement projects continue at full speed. There are only 52 certified hemp seeds of German origin, and similar targeted seed improvement studies will continue in Türkiye.
- **Hemp is stronger than carbon and steel! Hemp does not burn! Hemp is antibacterial!** There are hundreds of such baseless information. Such statements mislead well-intentioned

hemp investors and strengthen the theses of groups that have a certain prejudice against hemp. As we have mentioned in general; hemp is a source of cellulose and cellulose-based structures can be given technical features through chemical processes. In particular, the cotonization process, which is becoming widespread, is basically designing hemp fiber as a sustainable textile fiber suitable for daily use. In addition to its countless qualities and benefits such as its contribution to the soil, its sustainability, carbon footprint, efficient production, unlimited usage area, and being the main raw material for mass production, hemp does not need unscientific approaches and unfounded praise. It is enough to look at the rapidly growing market share to understand the importance of hemp.

- **Hemp investment provides a very fast financial return!** Unlike other ventures, the expectation of hemp investors is that the investment will turn into "financial profit in a short time." On the contrary, what those who will invest in the hemp sector should pay attention to is that the risks and opportunities that will arise when doing this business for the first time should be analyzed well.
- **Bureaucracy, politics and cannabis!** The hemp industry is a sector where the need for unity is expected more than other industries. The concern that hemp will be banned again due to politicians is expressed by different investors and they are hesitant to make investments due to this concern. Hemp awareness should be increased and one of the important national issues should be openly discussed in different channels. Especially, the expression of this emphasis at every stage of the bureaucracy will create a guarantee for the investor. Hemp is viewed positively or negatively according to the worldview and personality of individuals. Here, it is essential to save hemp from the "according to me – according to you" with a simple and standard language. Hemp is a national issue and is above politics. It will be a serious loss for our country's industry if it is sacrificed to hesitation, suspicion, assumption and fear.

Image 5: Different area hemp production trials

- **Hemp is the business of farmers!** Today, no sector can survive alone. In this case, it is a mistake to leave hemp to the work of only one group. Hemp is a series of processes from seed to the targeted final product, and each step of these processes must be integrated with each other and interdisciplinary work is required. It is not possible for us to compete with the world in hemp without the unity of bureaucracy-science-sector.

3. CONCLUSIONS

Hemp Vision

After the Covid pandemic, hemp plays a leading role in the new world's search for sustainable raw materials. In order not to miss the train in the hemp industry, which has a five-ten-year history compared to advanced technological industries with a century-long development process, it is quite possible for developing countries to quickly adapt to hemp R&D and P&D studies and specialize in areas suitable for the country's infrastructure, and to brand as an outcome of this. While branding requires serious competition in developed sectors, the possibility and probability of branding in hemp is much higher. Our reaching a challenging position not only in hemp end products (textiles, oil, etc.) but also in hemp technology (machinery, know-how) depends on the planned investments we will make in the 5-10 year period [5].

Success in hemp depends on the holistic handling of all processes from seed to final product and the evaluation of the input-output balance with the highest added value products. Therefore, it is essential to start the hemp industry in the optimum way with interdisciplinary coordination and to manage the process correctly. Investing in hemp with temporary enthusiasm and urban legends will reflect negatively on the hemp sector - as in narcotic discourses - and will cause disappointment. Attributing entrepreneurial mistakes to hemp has caused serious damage to the sector in the last 5 years. These negativities are due to the wrong planning of the entrepreneur rather than hemp itself. First of all, it should be noted that hemp is not a plant/sector that will reach unlimited profit or break-even point quickly and make a profit in one year. This erroneous assumption misdirects all potential components of the sector and leads to an unnecessary pricing policy. The two main problems that worry domestic and foreign investors are the high costs of planting and harvesting and the lack of a ready market for the resulting material. Overcoming these two main problems is possible with serious and detailed feasibility R&D. A similar initial process is valid for all countries. The basic paradox here is: “Which comes first, the chicken (industry) or the egg (agriculture)?” With a serious and unprejudiced preparation of the feasibility, first the appropriate seed and planting area must be determined, then the design and production of value-added hemp products must be ensured [6].

Finally, evaluating hemp with a “Life Cycle Analysis (LCA)” rather than just the profit and loss provided by the developed product would be much more useful in understanding the importance and seriousness of the issue. The profit and loss analysis of the hemp business should be made by taking into account numerous side outputs such as improving the soil, contributing to the carbon tax, increasing harvest yield with rotational planting, and transforming the textile sector from a polluting to an environmentally friendly identity.

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