A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in partial fulfillment of the Degree of Master of Science

Perspective for a hemp renaissance in Republika Srpska: status, drivers, obstacles, and possible concerns.

Igor Kalaba March 2022 Vienna Notes on copyright and the ownership of intellectual property right:

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Igor KALABA

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by:

Igor KALABA

for the degree of Master of Science, titled: Perspective for a hemp renaissance in Republika Srpska: status, drivers, obstacles, and possible concerns.

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The current state of environmental degradation is on a scale so large that any solutions considered should ideally be cross-sectoral. Industrial hemp is touted as a plant of tens of thousands of uses, in many of which it can substitute harmful substances, such as plastics or other crops which have a larger environmental footprint. At the same time, hemp is slowly returning, being touted as an extremely cost-effective crop, lately fueled by a major grow in CBD consumption. Among those are also the farmers in Republika Srpska, where the countryside is slowly dying out. At the same time, world-wide, the policy is falling behind the markets, and would-be hemp farmers are often finding themselves in a gray legal are, risking to not only loose their investments, but also to get in trouble with the law. This paper takes a look at the main drivers of the hemp boom, and by employing several case studies, in the USA, EU and Serbia to identify the main obstacles in order to provide recommendations for those interested in growing hemp in Republika Srpska, as well as for all relevant stakeholders. The findings spell out a possible possitive outlook both for the farmers and the environment, but only if a pattern of policy issues is corrected and a strategic approach utilised.

Keywords: Industrial hemp, Republika Srpska, Agriculture, CBD

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List of Abbreviations

BiH: Bosna i Hercegovina/Bosnia and Herzegovina
CAP: Common Agricultural Policy
CBD: Cannabidiol
EIHA: European Industrial Hemp Association
FAO: Food and Agriculture Organization of the United Nations
FAOSTAT: The Food and Agriculture Organization Corporate Statistical Database
UN: United Nations
HFI: Hemp for Ireland
RS: Republika Srpska
THC: Tetrahydrocannabinol
VCS: Voluntary Coupled Support

1 Introduction

1.1 Background

Hemp is said to be among the first plants to be foraged, grown, and used by humans. Thanks to the mix of its properties, and human's ingenuity, its uses seem to be only limited by our imagination, especially in today's era. First used as food, feed, medicine, clothing, and inebriating agent in both secular and religious undertakings, with time it turned into one of the most diverse resources used by humans, with sources claiming more than 70 000 uses for the plant, across multitude of industries and purposes.

However, despite its numerous recorded benefits and historical importance, in the first half of 1900s it was slowly pushed to the margins. Today, as it makes a comeback, the general public's kneejerk reaction when hemp is mentioned is extremely polarized. On one hand, there is a strong opposition as an outcome of demonization of industrial hemp due to its, very real, correlation with marijuana. The second group can freely be described as overly enthusiastic propagators who tend to place an exuberant amount of fate in hemp's characteristics, be it in healing, building, energy, apparel and other sectors, or the positive environmental impacts its farming and products can have. The same expectations are put in its economic potential. For full disclosure, the author of this thesis was often tempted into aligning with the latter. As is often the case, the truth lays in the middle, as both sides have valuable arguments on their side. As hemp renaissance made a slow appearance in the Balkans, it attracted the attention of several potential investors in the region as well. However, in the last 20-30 years there has already been several examples which could be used to develop potential scenarios for its comeback in Republika Srpska (RS), as well as to avoid the potholes in the process.

1.2 Motivation, aims and objectives

The selection of a research question proved itself to be much more challenging than what was expected at first. This occurred primarily due to the scale limitations of a master's thesis (length, time), the author's personal limitations, such as the amount of knowledge and skills, e.g. lifecycle or economic analysis, and finally with the "gap in research" pre-requisite. When it comes to author's personal motivation, the defining of the research question was guided by following objectives and motivation:

- Final thesis would ideally be related to an issue which contributes to, at least a potential if not a definitive, improvement of the environment, and people's quality of life.
- Ideally, the findings of the thesis will have a real-world impact/relevance.

The topic of industrial hemp was present early on during the first semester of the course, and even prior to that. It was this plant's multifold uses in which it can substitute hazardous materials and harmful practices, while potentially improving the financial outlook of farmer's daily life that drew attention and interest. This is where the main theme was formed early on, and it was the merging of it with the above-mentioned criteria that demanded several rounds of consultations with my mentor, prof Illés, as well as other professors and colleagues in order to narrow down the topic of this thesis. The first working title of the thesis was "Industrial hemp's contribution to environmental sustainability of apparel industry and to the economic outlook of Bosnia and Herzegovina's agriculture". However, the extent of work and length of such a topic would not only greatly exceed the format of a master's thesis but achievability of planned data collection and analysis would exceed both the time limit and expertise level of the author. Following that, the research questions were adjusted to accommodate this challenge, again, keeping in line with the main motivation. The new questions followed a train of thought which can be summarized in in the following statement: Assuming industrial hemp holds potential to, through its farming, processing and final products, decrease the environmental footprint in certain strands of industry and everyday life use, what would the perspective/outlook for its production look like in RS? The aims and objectives of such an approach would be the following:

- To understand and inform the reader about the history of hemp farming and production in the world and the current trends, with data and sources, in order to create a nonbiased, fact-based discussion.
- Screen examples of hemp's return in other locations in order to find good and bad examples for the sake of learning.
- Summarize the findings in a manner which might as a source of information and cautionary tale for farmers and businesses interested in hemp farming or production in RS, as well as to inform the discussion and hopefully lawmakers weighing in on future pieces of legislation related to industrial hemp.

1.3 Research question

The main research question of the thesis is straight-forward at a glance but encompasses several questions, the main being: What is the status and future outlook of industrial hemp production in RS?

As this is a broad examination, the sub questions leading the thesis have been defined as follows:

- What is the status of hemp production in RS, in terms of production and what is its legal status?
- What are/could be the major incentives for hemp growing in RS?
- What are the major obstacles to further development of hemp farming?

The questions are primarily an outcome of real-world developments, however at the same time a part of their answering will draw from literature and theory and will along the way indicate where the knowledge gaps reside. In terms of Blaikie's) three types of research questions (Blaikie 2009), the primary questions of "What" is answered mostly in the introduction and literature review portion of the thesis, while the "Why" and "How" are to be dealt with in the Discussion and Conclusion chapters. As far as Denscombe's classification is considered (Denscombe 2009), the questions deal with "description" (What is it like) and "development of good practice" (How can it be improved) but is also preceded by the "Explaining" (Why does it happen) question.

1.4 Gap in research

The latest peak in interest for industrial hemp has mainly been driven by two interests, one could be dubbed as environmental, with its propagators looking to use hemp as a substitute for a myriad of environmentally harmful products and materials, and the second financial, mostly related to the new markets, such as CBD and food supplements with vegetable protein.

What both motives have the same are some major expectations from the plant. Academia has however yet to dedicate the attention such high stakes and expectation deserve, albeit it is far from invisible. While academic work in area of policy and strategy of hemp farming is relatively small in numbers, other fields, such as agrology ((Augustinović et al. 2017;Lukačević 2016;Farag et al. 2017), material sciences ((Vandepitte et al. 2020;Grégoire et al. 2020;Clarke 2010) are more abundant, usually exploring and reporting on mechanical, technical and biological details related to different varieties of the plant and their farming, as well as the influence of environmental factors to the plant's growth performance ((Drastig et al. 2020;García-Tejero et al. 2014;Adesina et al. 2020;Chailakhyan et al. 1978) and quality of its final products. Potentials for energy production have been researched as well (Parvez et al. 2021;Finnan et al. 2013;Rehman et al. 2013).

The policy side of future development has been less researched, and mostly by organizations and companies dealing with the plant, primarily driven by commercial and

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practical issues, rather than for academic curiosity. The gap in knowledge wideness further when the geographic scope of the research is considered. During preliminary phases of literature research, no similar work of this format has been found for RS, and the research in the region mimics the status describe above.

1.5 Scope and limitations

For the biggest part, the scope and limitations have been described in the previous subchapters, therefore here only a few additional explanatory points will be added. Regarding the geographical scope, the primary considerations for a state-level approach were abandoned due to the complex bureaucratic set-up of BiH. Instead, the scope was set to the level of RS. BiH is comprised of two entities, Federation of Bosnia and Herzegovina and RS, and Brčko District. These three entities have separate governing structures, as well as legislative packages. Making the matter more complex are the ten cantons which make up the Federation of BiH. To make the findings have relevance in the real-world environment, as well as to fit within the deadlines, the final decision to keep the geographic scope on RS was made.



Fig 1 Administrative divisions within BiH (TUBS 2012)

For the scope of the approach, a mix of social, policy and economic overview are utilized.

For the biggest part, information gathering took part in BHS ¹and in English.

The major limitation was met during the attempts of securing interviews. None of the planned took place, but email correspondence took place with two of the originally planned interviewees.

1.6 Structure of the thesis

The above-described objectives have been achieved in the following way.

The need for overall understanding of hemp's biology and ecology, as well as historical value and importance for the human population is researched in the policy review section. There, evidence of its use in RS and the region it is located in is described as well. This is also where the aspects which contributed to the decrease in hemp's production are discussed.

A major part of overview and discussion related to obstacles and good practices is addressed in the Discussion chapter in a form of case studies of the United States of America, European Union, primarily France, and Serbia, closing with the description of the current status of production and policy in RS.

¹ BHS stands for Bosnian, Croatian, Serbian language.

2 Methodology

2.1 Theory behind "Policy environment"

The closest description to the approach of policy analysis performed in this thesis is that given by Mayer when he wrote that while undertaking policy analysis some will "reconstruct and analyze political discourse or set up citizen fora" (Mayer et al. 2004).

Overall, for this paper it can be said that it does not employ a policy analysis per say but rather an attempt of representing the overall policy "environment" "ecosystem" or "landscape". Such a description is best suited, as hemp has a very strong presence while residing in several of those environments. So, if one is to try and depict hemp, he would have to paint several "landscapes" as presenting it without this mosaic of influences and relevancies is certain to leave an unfinished painting. On the other hand, describing the entirety would demand much more space, time and a multi-disciplinary team. Some of the "environments" are:

Policy

There are several aspects which ask for an in-debt analysis when discussing the development of hemp legalization documents. First of all, while evidence might be clear to some (i.e. hemp being impossible to use for inebriating uses since its extremely low on Tetrahydrocannabinol (THC), cognitive bias, social conditioning as well as precautionary principle amid very possible misuse still have a strong influence on policy development. These appear both among the general population, agriculture stakeholders as well as those in charge of policy development and approval. There is a very clear line of division among the general population with one side supporting complete legalization not only of hemp, but cannabis altogether and the other propagating a complete ban. One side has tendencies of over-selling the plant, believing it to be a panacea for all ailments of man and society, while the other sees it exclusively as a narcotic or a good paravane for narcotic manufacturing and trade. If a policy

is to be successful, middle ground is necessary as much as a constructive, evidence based and solution-oriented discussion.

Economy

There is no doubt that hemp, like very few crops can provide for a sizeable income for those willing to bet on it. The size is in popular sources quite often overestimated however, which gives birth to disappointment as well as palpable financial issues for those who might have ventured in the field with high, yet unsupported, hopes. Adding to that is the relatively under-developed supply chain throughout the world as well as a policy environment which is often unclear at best in many countries. A great deal of work needs to be invested in de-risking the budding markets as well as to manage the expectations of those hoping to strike gold on their first season.

Environment

There is bountiful evidence of potentials for hemp in decreasing the environmental footprint across different economic sectors. However, while very real, these effects need to be viewed in a lifetime cycle approach, especially taking into consideration the agricultural systems, land conflicts, as well as seed sovereignty (as currently, in all cases observed, only patented sees can be used, direct propagation and cross-pollination by farmers is strictly forbidden). Only with an in-depth look and stern guidelines can a backlash be avoided.

Health/medicine

Hemp growing for CBD is among key motivators for the most recent hemp expansion, not only is it the most financially lucrative hemp-related undertaking, but many are also drawn to it due to its beneficial effects on human health. While those who believe in hemp's healing properties can at times be zealous and reference non-scientific research and personal or word of mouth experiences, new peer-reviewed analysis are appearing and giving proper reason to accept CBD and other cannabinoids as important new mainstream medicine. However, additional work is necessary to provide certainty regarding side-effects and other drawbacks, and new policy should follow as soon as possible to make certain that the growing practices for hemp used in medicine are in line with the necessary standards, e.g. pesticide use, and that its origin are safe, but still in a way which would allow farmers to partake in the market, under attainable and equal conditions for all.

A disruptive plant for disruptive technologies

Touted as a multi-purpose crop, claims are made about hemp being an ingredient for anywhere between 20,000 to 70,000 products and growing. It holds great potential across the fields, from food to architecture, as a plastic substitution, garment production, biomass energy, etc. This potential could send ripple effects which should be researched in debt throughout economies.

Societal

The societal aspect is, in this thesis mainly connected to the status of villages in RS. They are dying out and farmers are fewer and farther in between as the time passes. The assumptions being made are that there is a possibility for hemp to provide a stable income, thus encouraging people to stay, or re-populate the country side, either with hemp being the main, or a side-profit crop, but an important contributor non the less.



Fig 2 Imaging the policy process by Cairney (Méndez 2017)

This approach can also be partially described also as system thinking, an interdisciplinary approach which tries to depict reality via system analysis and system dynamics (Haraldsson 2004). In this case, mainly the system analysis is utilized, which is the more holistic and qualitative method. Applying system analysis methodology to industrial hemp will aid in determining the most important stakeholders and variables contributing to the limitation and expansion of the industry.

Finally, Cairney describes a policy cycle (Cairney 2016) as a series of stages:

- Agenda setting
- Policy formulation
- Legitimation
- Implementation
- Evaluation
- Policy maintenance, succession, or termination

While aware of its inadequacies, it is the author's hope that this document might in future aid the agenda setting and policy formulation processes for future hemp development in RS, BiH and hopefully wider.

2.2 Case study methodology

The case study approach was selected to utilize, as much as possible real-world experiences and outcomes of various undertakings. There were two primary motives. First was the, already mentioned, wish for this paper to both encompass as well as influence real-world events. The second was a lack of similar type of analysis in literature. This falls in line with Baxter's description of qualitative case studies: "ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood" (Baxter et al. 2010). Following Baxter's types of case studies, the work presented in this work can be categorized as a qualitative case study, as well as primarily descriptive, as opposed to explanatory and exploratory (Yin 2003). However, elements of exploratory and Multiple-case study are present as well.

Descriptive	Explaining presumed links in real – life
	interventions which could not be grasped via
	surveys or experimental strategies.
Explanatory	Exploring events or scenarios where the
	intervention in question has no clear, single
	set of outcomes (Yin, 2003).
Exploratory	Interpreting an intervention or occurrence
	and the real-life context in which it occurred
Multiple-case study	Enables exploration of differences and
Multiple-case study	Enables exploration of differences and similarities among cases. A great accent
Multiple-case study	Enables exploration of differences and similarities among cases. A great accent should be put to case selection, in order to
Multiple-case study	Enables exploration of differences and similarities among cases. A great accent should be put to case selection, in order to make comparation and conclusions possible

Table 1 Types of case studies by Yin (Yin 2003)

The selection of case studies was influenced by two parameters. The first was connected to hemp directly. Since it is a new, or better said a returning crop in most of the world, cases were selected where experience is already gained in its introduction. USA was chosen because of the size of its economy, which translates into the potential of trendsetting, as well as potential for exports (from RS). This was proven true in the Serbian case study, since one of the companies has already opened a branch in the USA. The CBD rush is maybe the strongest in the states, and since CBD is a major part of the alure for hemp farmers, it made it even more attractive as a basis for a case study. Both EU and Serbia also fulfill this requirement as well, and even better, since their position, historical, political and economic importance for RS is even greater, which was the second parameter. On one hand, EU is the largest economic partner of BiH, and is bound to be of economic interest for hemp producers as well. On the other hand Serbia is of similar importance if not larger when historical and cultural connections are to be taken into consideration, as well as size of economy and similarities in policy and international position (e.g. EU accession status).

Throughout case studies conclusions were drawn, which were synthetized in the final chapter of the analysis in order to produce the final recommendations, as well as to point out the necessity for further research.

2.3 Site selection

The focal point of the research is RS. While being an integral part of Bosnia and Herzegovina, it is solely due to the cumbersome bureaucratic division within the country, and the limited format of the thesis that such a geographical focused was decided upon. However the final recommendations span to both entities of BiH, and beyond. The other main reason was the primary presumption that hemp has the possibility to improve lives and the environment. RS is the perfect example for such tests, as it is bountiful in farming soils and well positioned to export products to larger economies, while also in urgent need of economic stimulus and a new development paradigm, both in agriculture as well as economy and society – wide. Other than that, Serbia and RS already have a number of hemp pioneers, who's experiences could be compared to those from other countries, and their knowledge used for building a database for future researchers as well as hemp farmers and processors.

2.4 Literature review methodology

The literature review was conducted mostly using qualitative literature. Numerical data was used seldomly, and with great attention to accentuating that the data is only descriptive for the most part, since there are numerous variables and the inputs are not in the highest of accuracy, however still sufficient to represent the general landscape of the current affairs.

Once the Motivation, Aims and Objectives and the research questions have been formulated, the process of document research started, since a quality Literature Review is the first step to surveying a topic as well as for introducing the reader to the thesis before them. For this purpose, several websites and library services were used in finding works of academic writing, including:

- CEU library (online)
- ScienceDirect.com
- Jstor.com

- Scribd.com, and
- Google Scholar
- Research Gate

Some reference documents and scientific documents have also been forwarded by the potential interviewees as well as colleagues and the teaching staff at CEU, such as the paper *"The effects of recreational cannabis legalization on forest management and conservation efforts in U.S. national forests in the Pacific Northwest"* (Klassen et al. 2019) which was recommended to me by Professor Brandon P. Anthony and which raised one of the key concerns when it comes to environmental concerns in hemp farming practices which is the danger of deforestation for the needs of farmland expansion.

Another venue of extreme importance were the specialized free access libraries and research engines, such as the SciHub and Crossref, true champions of equal opportunity for all in academia and knowledge and information dissemination worldwide.

Further research was conducted via the two following venues: Policy documents related to hemp farming, production and distribution, primarily those of RS, but also of other countries where documentation was available. Research was done primarily through websites of the relevant ministries, as well as those of organizations working with hemp. Additional source was email communication with ministry and organization representatives.

The other important source were the hemp-related business organizations and farmer's associations, which gather all interested parties in order to advocate for policy changes which would make hemp industry more accessible and lucrative for all interested. Next to them reports and analysis by organizations such as the Food and Agriculture Organization of the United Nations and other were utilized as well.

The main keywords in research were "hemp" and "industrial hemp", however, to narrow down the search the following phrases were researched in conjunction with the following phrases:

Tuble 2 List of major heywords used for document research		
Sustainable	Agriculture; Water use; Pesticide use; Soil	
	restoration; Regenerative farming,	
Environmental	Footprint, Protection, Pollution	
Profitability	Comparative, Production, Seed, Flower,	
	CBD	
Legal	Status, CBD, hemp,	

Table 2 List of major keywords used for document research

While performing information research and reading, all relevant findings were noted at the same time, and divided by field (e.g. legal issues, environmental, ecological), in order to create relevant and informed place-holders for the overall narrative. Once collected, these placeholders were revisited and written into coherent chapters. Referencing was performed from the beginning (albeit not in line with the CEU rulebook) in a way which made it easier to trace all the sources. Once the text was finalized, the proper referencing was introduced via Zotero software. This was performed as one of the last steps in the thesis process.

Next to academic papers, formal policy documents are used in the making of this thesis, along with industry and NGO briefs, reports and policy documents. Additionally, media articles are utilized as well, however only those using direct quotes and identifiable interlocutors were used in cases where strong statements or data where shared.

2.5 A word on wording

For clarity's sake, this short subchapter is dedicated to two words and concepts.

"Industrial hemp" (Cannabis sativa L.) will, for the sake of brevity be throughout most of the text referred to as "hemp". At the same time, the THC – rich variety of cannabis, used for inebriating purposes, will be referred to as marijuana. Where marijuana is discussed, the word itself can describe both the plant in its entirety or its processed parts (such as dry flowers).

The other concept is related to environmental protection. The terms such as "sustainable", "environmentally friendly", "ecological" might be used while referencing to the same or similar concepts, primarily due to the way these words are used in BHS. The oftenused definition from the UN World Commission on Environment and Development defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The author subscribes to the concept that sustainability is not the perfect term for describing the scale of environmental impact since, when it comes to human activity, it only exists withing the sphere of comparison and the true scale of impact of our undertakings is often not completely measurable nor known until the negative consequences arrive. In that way the use of the term is used primarily when referring about hemp's perceived or measured smaller impact on the environmental, i.e. hemp being more sustainable. However, nowhere in the text does the author subscribe to the popular idea of hemp being an environmentally friendly panacea at face value. Just like any undertaking, it has its benefits as well as downsides, limits and conditions to reach its environmentally friendly potential.

Additionally, while this paper's primary subject is RS, at places BiH will be referenced. In these instances, the stated facts or opinions pertain to both Federation of BiH as well as RS, together with Brčko district.

2.6 Limitations

Primary external limitation was the lack of availability for semi-open interviews which were planned as an important source of information, as well as a critical voice for assumptions and theories written in the thesis. Unfortunately, due to a range of reasons, the interviews never took place, except for two written responses which were used in the analysis non the less. When it comes to information gathering, two major issues occurred. The first is related to receiving exact and consistent data on farming, both international and especially in RS. BiH altogether has notoriously problematic statistic records, however the data obtained was still useful in painting the overall picture and making the main assumptions. Globally, there is no lack of data, however they are not completely consistent, and the accuracy is at times questionable, however still enough for a birds-eye overview performed in this paper.

3 Literature review

The literature review in this paper will mainly focus around three themes relevant for the background of the overarching topic of hemp, and their wider implications, as I aim to provide a more detailed description of the he historical connections between mankind and hemp, primarily to illustrate since when, how and to which extent was it used by homo sapiens going back to the earliest findings, how the use and the attitudes around this plant developed leading up to its today's status. The second is the history of hemp in the area of Bosnia and its surrounding. The third is the morpho-physiological and other characteristics of the plant itself, in order to better acquaint the reader with the plant itself and its potentials.

The goal of this literature review is to, through the already established and obligatory for an MSc thesis format, introduce the industrial hemp to the reader and in that way not only provide the background for the final discussion and findings, but also make clear the justification for the choice of the topic, and the importance hemp itself used to hold, and might once more.

3.1 A companion since the antiquity: from food, sails and ropes to audiences with the Gods

This chapter aims to show the importance of hemp for the humankind, and will do so throughout time and geographies, showing not only how long the plant has been foraged, grown and utilized by humankind not through decades or centuries but millennia, but also how it spread across the planet as well. It is organized in two main parts, the first aiming to illustrate how long the continuity of hemp use is among homo sapiens, as well as how widely spread its use became. These two aspects of its use, temporal and spatial together also testify of this plant's vast potentials and variety of usefulness across a number of purposes and industries.

Considered by some as among the first plants utilized to and known by man, Cannabis genera has been foraged and grown by humans for its various uses for thousands of years, much before it gained notoriety in our modern society for its inebriating purposes (Walker 1998).

Over the ages its chemical, nutritive and mechanical properties were exploited by our ancestor so they could eat, cure, clothe, travel and much more (Walker 1998;E. B. Russo 2007).

A sufficient body of archaeological and palynological data provides us with an abundance of evidence all pointing that humans have been actively interacting with hemp starting some six thousand years ago, with research mapping its presence in numerous sites in Asia, Europe as well as the American continent(Fleming et al. 1998). It is also mentioned in ancient mythologies, such as the Indian Vedas, writings which reach as far back as 2000-1400 B.C.(Bapat 2015) The Atharva Veda calls it a liberator and a joy-giver, given by the graces of the gods to give us delight and relieve us of anxiety, with an angel residing in its leaves (Abel 1982). As such, it was heavily used in medicine and claimed by practicians to aid with all sorts of afflictions, from headaches and dandruff to venereal disease and tuberculosis (Hofmann et al. 1992). The presence of a deity called Magu, which can, among other, be translated as Hemp Maid, in China, shouldn't surprise us either, since its cultivation in China reaches back into the times of Neolithic (Li 1973), and the stories from Mahayana strand of Buddhism contains the claim that while practicing asceticism on his path towards nirvana, at one period the Buddha gained all his daily food needs from a single hemp seed (Touw 1981). The Greeks were no strangers to it either, and used its healing attributes extensively (Butrica 2002). The cultural breadcrumbs are however not the only leads we have to hemp's immense presence and importance in human societies throughout time and geographies.

A complete consensus is yet to be reached regarding hemp's origins. While some authors attribute it to overall central Asia (Hofmann et al. 1992), other parts, such as Eastern parts of the Asian continent, China, foothills of the Himalayas and Russia are seen by some as the original geographies from which it spread. Its migration to Europe most probably occurred with Scythians, as reported by Herodotus (Ren et al.).

As described by Schultes and Hofmann fiber remnants have been found throughout Europe and Asia, usually as surviving components of apparel, clothes and ropes (Hofmann et al. 1992).

Hemp seeds, or more precisely achene fruits are found in many a site, and are by far the most reliant physical data for identification, together with imprints, when compared to pollen and cord findings, as e.g. polen can be mistaken for that of the common hop. Seed remnants have been found across Europe, including the north (Larsson et al. 2015), dating back to Roman Iron Age i.e. around 1-2nd century AD. Larsson author goes to suggest that the plant was introduced in the Scandinavia sometimes between 1-400 AD. His findings also point towards the practice of retting, whereby fibers are extracted, which indicates practical use beyond medicinal, dietary, religious or as a pastime (intoxication).

Findings in England also point to its cultivation and use for fiber, oil and seeds, and that the first substantial findings point to its cultivation since 2000 B.P. (Larsson et al. 2015). In their introduction to their research, Bradshaw et al go on to list a wide body of work testifying on findings across the continent: "There is also a growing body of data for the history of hemp in continental and northern Europe, e.g. Germany (Clarke et al. 2016); Czechoslovakia (J. McPartland et al. 2018), and elsewhere).

There is no lack of data for the Asian continent. Yin (Yin 2003) quotes Okazaki et al (Okazaki et al. 2011) stating that the exact origin of the hemp plant's domestication is still not completely agreed upon, but that the two most frequently supported theories are referred either to China or Central Asia. They also provide a detailed overview of sites where archaeological remains have been found, such as Okinoshima, a small island located off the coast of Japan, where seeds have been found which have been dated to 10,200 B.P.(Okazaki et al. 2011) and findings date hemp in China to the neolithic era (Li 1973).

Figure 3 Script originating from China, depicting the word "ma" (麻; "cannabis") depicting plants hanging in a shed (Magu (Deity) 2022)

The oldest finding of paper was that made of hemp. It was found in a grave, situated in Shensi province, modern day People's Republic of China, and is dated to a time prior to the rule of Emperor Wu (early Han Dynasty) (Li 1973).Hemp fibers were found in paper scraps in several other sites (Fleming et al. 1998).

Further findings ensued, such as that in the Turfan site located in western China's Xinjiang Province(Li 1973). Next to the scripts, found as well were shoes made of glued layers of white hemp paper. The paper was sewn together using hemp threads as well.

As far as Africa and the Americas are considered, the arrival was somewhat later, yet still early on when it comes to society as we know it. For Africa, it is considered to have spread from Asia Minor and is partly attributed to the spreading of Islamic influence, however its growing and use is wider than the regions where Islam is the prevalent religious and cultural influence (despite Islam not looking fondly on the practice of inebriation by the plant)(Merzouki et al. 2014). Fleming et al accumulated findings and quote Schultes (Schultes 1970) who attests the period between 4000-3000 BP as the earliest time Cannabis is found in the African continent, but that the first definitive material evidence, as claimed by Van der Merwe (Merwe 2011) hails from to the period between 640-500 BP(Fleming et al. 1998). It

reached the American continent much later, arriving to North America in 1606 (Cherney et al. 2016) and prior to that in the South America (Yun-Casalilla et al. 2021), with the support of the Spanish monarchy in the 1500s.

The above presented is only a segment of the overall body of work representing the antiquity of hemp's use, and while certain data for several sights and findings is still up to debate and awaits either additional findings of easily identifiable remnants or new methodologies and techniques of identification, there is no place for doubting that hemp has been used and changed by humans for several millennia. The following part of this review will aim to present, again historical findings, but in this turn not focusing on geographical spread and age, but the exact use of the plant.

While the modern industrial hemp is, mostly due to legal reasons, carefully engineered to exclude as much as possible of its main psychoactive components, primarily delta-9tetrahydrocannabinol (THC), historically, the plant was abundant with it, and the same strands which were used for e.g. cordage, clothes or food, contained the potential to be used for inebriating purposes, be it for the worldly, relaxation and entertainment reasons or in a religious context. Additionally, other chemical components also imbued the herb with healing properties. Both the healing and inebriating properties were reaped in several ways, such as, inhaling (smoking), consumption (as food or beverages) and in forms of ointments. Inebriating and religious use has been reported by a wide number of authors, and is still relevant today, albeit today's distinction between different types of hemp is clear and of critical importance for the subject matter of this thesis.

As mentioned in the previous example, around 100 A.D. Herodotus wrote about Scythians creating small saunas using animal hides, where several people would gather, but added to the fire was hemp, which created an intoxicating vapor (Godwin 1967). This method would be referred to as "hot boxing" in today's cannabis related slang.

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Herodotus (450 b.c.) described the Massagetae tribe's (Iranian people) method of inebriation as a group affair: "They have also discovered a kind of plant whose fruit they use when they meet in groups. They light a bonfire, sit around it, throw this fruit on the fire, and sniff the smoke rising from the burning fruit they have thrown onto the fire. The fruit is the equivalent there to wine in Greece: they get intoxicated from the smoke, and then they throw more fruit on to the fire and get even more intoxicated, until they eventually stand up and dance, and burst into song"(Herodotus 2008). In another part of his writing, he also describes the Scythian ritual, while directly referencing cannabis (using the word "ka' uuabij"): "After burying their dead, Scythians purify themselves. First they anoint and rinse their hair, then for their bodies, they lean three poles against one another, cover the poles with felted woolen blankets, making sure that they fit together as tightly as possible, and then put red-hot stones from the fire on to a dish which has been placed in the middle of the pole-and-blanket structure" (Herodotus 2008). Godwin also cites on to cite Artamonov (Artamonov 1965) excavations of Scythian burial tombs in the Altai Republic where elaborate inhalation apparatus was found.

Walker (Walker 1998), while referencing to Williams-Garcia describes "santa rosa", a name given to a strand of hemp whose leaves are chewed during religious ceremonies, in order to provide them with an audience with the gods. Ernest also lists several examples of medical use, such as the concoctions used by certain groups in Columbian Municipio, such as a mix of rum soaked hemp which is applied on the skin in order to reduce joint and muscle pain, while smoking is used to ward off fatigue.

Antiquity of hemp use in Egypt was claimed by several sources. In his review, Russo (E. B. Russo 2007) quotes Nunn's work (Risse 1999) in which he cites six experts, claiming that hemp was used since the pharaonic times, with application being administered through skin bandages, ingestion, anal and vaginal suppositories, as well as through fumigation. While not proven without any doubt, the plant which the Egyptians called *shemshemet* is, as claimed by

Russo and those he quoted most probably Cannabis sativa, as it is also referred to as the plant "from which ropes are made" (E. Russo 2005).



Figure 4 Different names and spelling of the word "hemp" across culture (E. Russo 2005)

According to Perrot, Europe was introduced to hemp's psychoactive properties through hashish, and it was introduced by the Crusaders, but its deliberate use (and abuse) became fashionable after the Napoleon's army returned from its Egyptian campaigns (Kabelik et al.). Kabelik et al also list a vide array of medical uses of hemp in Europe in the middle ages, such as leaf extracts as vermifuge for horses, or in writings of Tabernaemontanus and Kramerarius, where dried leaves are kneaded together with butter in order to produce an ointment used for healing of burned skin, while Ruellius recommended that cannabis extract be used in form of drops, in order to cure ear aches, as well as ulcers. Kabelik et al also recount that in South America, more precisely Argentina, cannabis was treated and used as "a real panacea for tetanus, melancholia, colic, gastralgia, swelling of the liver, gonorrhoea, sterility, impotency, abortion, tuberculosis of the lungs and asthma". However, Russo (E. Russo 2005) advises diligence when discussing Cannabis use in medicine, as most of the healing done in Renaissance was performed while utilizing native hemp strains of Cannabis sativa. These strains were CBD-predominant and contained very little or next to nothing of THC content. It was only later, according to Russo, after 1840, that the THC-dominant strains of Cannabis indica gained more popularity and were more often utilized in Europe. "A watershed moment in the history of cannabis as medicine" in Europe as Russo puts it, and one of the earliest such experiments of medicine through the scientific method where folk knowledge was incorporated, was brought by one William Brooke O'Shaughnessy. In the late 1830s he transported a large amount of cannabis from Calcuta to India and provided physicians in the British Isles with it. Obviously this references the "western" medicine, since it is clear that in Asia, other parts of Europe and Africa, the plant was already utilized for this purpose.

The above-mentioned medicinal uses show that hemp's use for inebriating and medicinal effects transcended borders, continents, cultures as well as time. As for the medicinal uses, the findings show that hemp the users and scholars across the cultures attributed it antihelmintic, anti-inflamatory, anti-helmintic, sedative, antibiotic and neuroprotective effects. Modern science is catching up and confirming some of these practices as well with numerous studies being undertaken for a wide range of conditions, such as sclerosis, autism, cancers, Crohn's disease, epilepsy, glaucoma, multiple sclerosis (MS), post-traumatic stress, (Jugl et al. 2021;Busse et al. 2021) etc.

Modern studies, both in vitro and in vivo, have indicated a therapeutic role that cannabis may have due to its antiproliferative effects. The main actor providing for this effect is delta-9tetrahydrocannabinol (Famiglietti et al. 2020). Famiglietti et al's conclusions suggest that cannabis could be used for treating "chronic pain, neuropathy, spasticity, and as anti-emetics". However while some manage to find definitive links of cannabinoids, such as nabilone, nabiximols and dronabinol (Abrams 2018), others found contradictory evidence due to mainly a lack of larger clinical trials with substantial number of subjects (Rog 2010). Other review papers found numerous potential benefits for a number of conditions. A further in-depth exploration is needed to separate anecdotal and historical claims, but the findings in so far show sufficient reasons to continue pursuing further research. The same can be said when it comes to cannabinoids which can be extracted from industrial hemp, such as cannabidiol, most often referred to as CBD. While there are no definitive evidence, again, due to a lack of isolated, detailed and larger-scale experiments, CBD is considered as a potentially promising area for chronic pain therapy, which is especially important when the current epidemic of opioid missuse is taken into consideration (Urits et al. 2020).



Figure 5 Map of hemp throughout history (E. B. Russo 2007)

One of major factors which started the downfall of hemps strategic importance was the drastic decrease in sailboat and horse-drawn carriage production and use. Adding to that the new technologies such as synthetic fibers, as well a drastic increase in industrial-size cotton farming, hemp, which was extremely laborious and demanding in processing, hemp did not stand a chance. Another important factor was its legal status and the demonization due to the
connection with marijuana. This was, as believed by some, partially fueled by willful action in the United States, and even draws connection with racism and discrimination towards black and Mexican population. The fight against marijuana in the United States also ended up being pointed at industrial hemp as well, since THC was still an unknown chemical. The Marijuana Tax act of 1937 is said to have been propagated via questionable studies and very poorly visited hearings (The Marihuana Tax Act of 1937 2022) (Additional Statement of Harry J. Anslinger 2022). Harry J. Anslinger was one of the first government officials to run an active campaign against marijuana and was soon joined by the newspaper mogul William Randolph Hearst. Hearst's was accused by several authors (French et al. 2004; Earleywine 2005), that he used his outlets which regularly published articles and reports on cannabis, to create a link in public perception between deviant behavior and violent crime and cannabis (Bonnie et al. 1974), in order to destroy hemp industry. It did not help either that THC as a component responsible for its inebriating effect was still unknown at the time, therefore there wasn't a solid basis for discerning between hemp and other, THC rich, cannabis strains. As a motivation they argued that this would have served his and the financial interests of Andrew Mellon and the Du Pont family (French et al. 2004), since the development of new hemp processing equipment threatened the role their wood pulp business had in the paper industry, or in case of Du Pont and Mellon, the market was in fibers, more precisely nylon. Prior to that, Jason L. Merril, The United States Department of Agriculture's (USDA) head scientist at the time published a document "Hemp hurds as Paper-Making Material", together with Lyster H. Dewey. The main message of this document was that paper made from hemp hurds (hemp's inner woody portion) was "favorable in comparison with those used with pulp wood" (USDA 1916). Next to that, and especially important for this paper and author's motivation – they claimed that hemp is a sustainable source of fibers necessary for paper production.

This is however just one of the theories and not a watertight one, since many other authors rightfully point to the mix of market mechanisms and physical properties of nylon which was a major disruptor in the fibers scene.

3.2 Hemp history in Bosnia and Herzegovina

There is little evidence regarding hemp growing among Slavic people, including the Balkans. It has been noted that they had contact with the Skits as early as the VII century before Christ, so there is a potential for knowledge transfer to have happened at this point, and after that, during their migrations, the Slav people brought the hemp along as well (Konoplja Se Uzgajala u Zenici 2015).

That is how it most likely came to the Western Balkan area. It was well known plant during Nemanjić reign of Serbia, and main fiber used for clothes, mainly among the commoners. Hemps depictions were found in monastery frescoes, drawings and ornaments on every-day objects (Kišgecki 1994).

At one point in the XIX century, in Odžaci, in Vojvodina region of Serbia, one of the most important European hemp stock markets was opened, and it was here that 8-day long hemp prices were determined. The market sold predominantly to rope producers, and a big part of it would end up being used by the British navy.

The WWII devastation significantly affected hemp growing, as well as processing, albeit the center of hemp processing was in the Vojvodina region and the surrounding area, not in BIH. In 1946 in Yugoslavia only had a reported 8,148 tonnnes of hemp fibers, but the following year that amount was already doubled. The peak year for hemp in Yugoslavia was 1949 when the areas amounted to 108,215 hectares, with 21,855 tonnes being exported.

In the times of hemp's largest expansion, between 1930 and 1960, it is estimated that there was globally no less than a million hectares under hemp. The Soviet Union made up for around 50% of that number, India some 20% and Yugoslavia up to 5%.

Country	Land under hemp (hectares)		
SSSR	350,000		
India	195,000		
Yugoslavia	44,000		
Romania	31,000		
Poland	23,000		
Hungary	20,000		
Pakistan	16,000		
Turkey	14,000		
Italy	13,000		
Bulgaria	12,000		

Table 3 Land under hemp in the top ten produces in 1962 (FAOSTAT 2022)

BiH was no stranger to hemp either. There are sources claiming that hemp was grown in and around Zenica. Some 3 kilometers from the city in a village called Čajdraš several devices for breaking of hemp were found. Hemp is also allegedly the origin of BHS word for rope - "konopac" coming from the word for hemp "konoplja". Hemp rope and fibers were also widely used as sealant in plumbing. The village Šerići was well known for its rope-making, and its name testifies it as well, since its origin is in Turkish word for rope/tape: "şerit". Hemp was also used for other necesities, such as medicinal, more exactly, flowers were picked and dried and used to fumigate rooms where the sick would lay, especially those with heavy cough, or mixed with honey and as part of edibles. The results was pain relieve and improvement of mood. Hemp seeds were also used for oil production, with sources saying that one liter of hemp oil, usually produced from hemp seed via cold press or boiling, usually used for medicinal purposes, could be traded in for five kilograms of butter or ten kilograms of pig fat, with cold pressed type being the more treasured between the two (Konoplja Se Uzgajala u Zenici 2015). Supposedly, fine ground hemp flowers were mixed with cookie dough and snacks were prepared for sickly and hyperactive children, as well as for the elderly, the malnourished and weak. This, together with the aforementioned mood improvement most probably points to the fact that old varieties of hemp used in those times were much richer in THC content than industrial hemp varieties of today. Pain, weakness, low body weight, chest pains were also treated with a mixture of hemp flowers and honey, where fresh flowers would be dipped in the honey for three to four weeks and later consumed (Kišgecki 1994). The traditional alcohol drink rakija was also mixed with, mostly dry, hemp flower and used for massage. Smoking of hemp was, according to available sources, not a common practice, and one article links the onset of hemp smoking to he first Bosnians who traveled to the musical festival at the Isle of Wight in the 1960s. However, the fact that a popular name for hemp was "veselica" (root of the word being "veselje" - joy) could indicate that people of BiH were well aware of its inebriating properties.

Yugoslavia was among the countries which ratified the UN Convention on Single Convention on Narcotic Drugs in 1964, which in the long run created problems for hemp farming as well. At that time Yugoslavia was the seventh largest hemp producer in the world. It was only in 1968 that police started inspecting hemp fields. The seventies saw an increased decline and disappearance of hemp from Yugoslavia's farms.

In December 2020, after receiving the recommendation from the World Health Organisation (WHO), UN removed cannabis from the list of most dangerous drugs which was adopted by the 1961 convention.

3.3 Hemp biology and ecology

While it was Fusch who first described it, the species Cannabis sativa was named in 1753, by the father of taxonomy himself, Carl Linnaeus, who classified Cannabis sativa as a monotypic species. Afterwards however, in 1974 more exactly (Walker 1998), Richard Evan

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Schultes offered a polytypic classification. It is defined as a dioecious annual plant (Small 2015), a member of the Cannabaceae family (at times Cannabidaceae), together with one more genus - Humulus. Today, however, this family is joined by 8 additional genera: Celtis, Girroniera, Lazanella, Parasponia, Aphananthe Chaetachme, Pteroceltis, and Trema. The family altogether contains some 170 species.

At times however, arguments were brought forth to migrate the genus into the Moraceae family, as well as Urticaceae (Nettle) family(J. M. McPartland 2018). While the issue of membership in the family has been finalised, the number of species belonging to the genus itself is still up for debate.

Over the years, there were several proposals for species under the Cannabis genus, but the widest recognition at the moment is of the following three: Cannabis indica, Cannabis ruderalis and Cannabis sativa (Gloss 2015). Its worth noting that some authors consider these species to be nothing but cultivars of C. Sativa (Small et al. 1976). While C. Sativa is tall and seldomly branched with branches positioned quite far apart C. indica is its opposite with its short stature, dense and compact branches growing in a conical or pyramidal shape. Somewhere in between is C. Ruderalis with its short appearance but is only seldomly branched(Walker 1998).

While marijuana, hemp's relative who's notoriety is in public and legislative perception often transferred to hemp as well, can come from both C. indica and C. sativa plants, hemp comes exclusively from the sativa family (Cannabis sativa L. subsp. sativa var. sativa). The confusion between the two is not surprising since these are close relatives, but their chemical make-up spells a world of difference. Key, and crucial differentiator for its legal status discussed further in this paper is the Tetrahydrocannabinol (THC) concentration. Whereby marijuana's THC contents achieve THC concentrations as high as 30% (Stuyt 2018), the THC content in hemp is in most countries regulated to incomparably lower concentrations, in many countries no more than 0,3% (Roth et al. 2020). According to Roth, most of the genotypes which were grown in temperate climates had a very low percentage of tetrahydrocannabinol (THC), and were traditionally grown primarily as a source of fiber(Roth et al. 2020). Further selective breeding of different cannabis strains resulted with what is today referred to as industrial hemp, with a very low THC content, specially grown for its bast/fibers and seeds, and on the other side the increasingly potent strains of cannabis – marijuana.

It is with this in mind that many cultivars of industrial hemp are today being developed. This means that industrial hemp does not possess inebriating properties, put in simple terms, can't get one "high" and therefore should not undergo the complex policy treatment its THCrich relative does.

Important for future discussion, but not covered in this paper, is also that THC is only one of the so-far discovered 110 cannabinoids found in the Cannabis genus, all of which possess, or might possess useful characteristics for man-kind (e.g. nutritive value, healing properties, etc) which could add further value to hemp, which itself is host to around 100, including CBD (Schluttenhofer et al. 2017).

While hemp is treated and can grow, if left to its own devices, as a common weed, if commercially exploited it still requires utilisation of agricultural techniques (Small 2015). Traditionally, hemp is planted either in rows, similar to corn or with utilisation of grain drills similar to other small grains.

While most authors agree that C. sativa originates from parts of Western or Central Asia and its temperate climate, its propagation by humans, agrotechnical measures such as soil preparation, irrigation, fertilization and selective breeding have significantly increased its range(Roth et al. 2020). Some authors, like De Candole (Roth et al. 2020) attribute the southern Caspian region as hemp's cradle, while others such as Walter and Sharma propose Siberia, China and the Himalayas. Being a short-day plant, it starts maturing when the day length starts falling below 12 hours of sunlight, thus, it is ideally planted between May and early June(Salentijn et al. 2019). In the Balkan and rest of Europe it gives yield once per year.

In the US, there are no herbicides specialized for hemp farming, so mechanical weeding is necessary, however standard techniques can be used as well, such as the no-till methods which include the use of burndown herbicides in order to exterminated weeds (Roth et al. 2020). Industrial hemp thrives in well-drained soils and a pH between 6.0 and 7.0. Wet or soils rich with clay suit it poorly, mostly because it does not react well neither to soil crusting nor compaction and the aforementioned type has the tendency to produce such effects (Roth et al. 2020).

Just as any crop, hemp is also at risk from disease and pest damage. Albeit at the moment, in the trial cases, which is the scale of growth in many countries due to hemp's relatively recent comeback, diseases are not a major threat. Up until now, diseases such as gray and white mold (Botrytis cinerea, Sclerotinia sclerotiorum), viruses, bacterial leaf spots and Pythium root rot and blight have been noticed. However as/if cultivation increases, especially if standard industrial, monocultural, approach is practiced, diseases and pests are bound to become a major issue(Hansen et al. 2019).

When it comes to diseases and pests, many of those that plague other crops present a danger for hemp as well. Insects like grubs, flea beetles, cutworm, grasshoppers (Cranshaw et al. 2019) and aphids have appeared in hemp fields in USA. In a research trial which took place in Pennsylvania (Roth et al. 2020).

Bird damage is a likely threat as well (Hansen et al. 2019), as Roth found too. He pointed a special attention to morning doves as particular fans of hemp's seed. The same source finds that woodchucks and deer are not a major issue and that the damage reported was nowhere near to that found in soybean and similar crops(Roth et al. 2020).

4 Discussion

4.1 A returning crop

The discussion portion of this paper is envisioned as an overview of real-life examples in countries where hemp has been making a comeback. In some examples, such as the USA that comeback is recent, while others, e.g. France have been actively dealing with hemp for the past several decades. While the countries do differ in many other features, the hemp – related developments can easily be put side by side and lessons drawn. A more in-depth analysis should be deployed in the future, in order to see how the aforementioned differences (e.g. size, economic power, history, and even religion and other cultural significators) between the countries influenced hemp's development and uptake in the said countries.

4.2 Hemp in the USA

It was in the United States of America that hemp growing was hit the hardest. After almost a century of complete ban, 2014 saw the Congress passing legislation green-lighting low-THC cannabis varieties-industrial hemp. The term "hemp renaissance" is nowhere more suited than in USA. The Farm Bill of 2014 opened the door by allowing the states to regulate as they see fit research and production of hemp via hemp pilot programs, thus allowing all farmers who acquire their state's authorization to grow hemp (The U.S. Hemp Market 2020). The oversight of pilot programs by the federal government was limited, but it was still far from a normal crop, as the permission for hemp farming could only be attained for a limited set of research purposes.

However, among those purposes included was also "market research" which was heavily utilized in order to kick-start massive programs which allowed farming, processing and hemp commerce(2014 Farm Bill Expiration: What Does It Mean for State Hemp Programs? 2022). Trade was allowed for all hemp products, including the most lucrative of all - CBD based products. Looking at the numbers, the State pilot programs were successful, and the amount of hectares under hemp went from zero in 2013 to around 36,400 hectares (90,000 acres) in 2018, in 22 states (USDA ERS - Hope for Hemp: New Opportunities and Challenges for an Old Crop 2022). For comparison, the highest amount of land under hemp ever recorded in USA was in 1943, and it amounted to close to 60,000 hectares (146,200 acres) (Mark et al. 2020).



Figure 6 Land under hemp in USA in the period between 2014 – 2018 (in acres)(FSA 2020)

As the USDA chart above shows, hemp's return was slow in the beginning, but picked up considerable speed in 2017. Year 2014 saw only Colorado, Indiana, Kentucky and Vermont reporting hemp growing, on an area of 755 hectares, with Colorado being the largest by far, making 97% of the area grown (Mark et al. 2020). As the number of states reached 22 in 2018 the programs grew as well, and so did the number of licenses issued, from 292 in 2014, up to 3,852 in 2018. It is important to add that many of these were smaller growers, as the average area per farm was smaller than 8 hectares. It was also reported that despite several issues in the first rollout of the programs, mostly those related to production methodology uncertainties and lack of adequate seed, in the period between 2017 and 2018, the number of approved licenses across the States more than doubled, clearly testifying the increasing interest. The 2014 Farm Bill, while not perfect, was by all accounts a giant leap for the hemp renewal in the USA, and in 2018 the next generation of this bill addressed some of the pertaining challenges. Farm Bill of 2018, signed by the POTUS on December 20 2018, let hemp growers make yet another step forward, mainly by removing hemp from the list of controlled substances, thus bringing hemp farming and production closer to that of other agricultural commodities, more precisely, the section 12619 officially removes hemp and all products derived from it, from Schedule I of the Controlled Substances Act.

The legislation-defined distinction between hemp and marijuana is the THC level. One of the major points of the 2018 Farming Bill is dedicated to this distinction. Despite the expansion and liberalization in comparison with the 2014 Bill, the most often found, world-wide limit of no more than 0.3% THC pertains, found in the section 10113 of the Bill (Conaway 2018). All plants containing more are considered as marijuana or non-hemp cannabis, therefore punishable under federal law.

It is important to add that the de-scheduling came after a long struggle between hemp producers and the DEA. However the farmers were not alone, as the de-scheduling was called upon by others as well, such as the American Farm Bureau Federation, the National Association of State Departments of Agriculture, the National Farmers Union as well as the National Conference of State Legislatures(Barret 2018), as well as political actors, such as Mitch McConnell, who was the Senate Majority Leader at the time. On June 28th, McConnell issued a press statement, saying: "For far too long, the federal government has prevented most farmers from growing hemp... Although it was a foundational part of Kentucky's heritage and today you can buy hemp products at stores across the country, most American farmers have been barred from planting it in their fields." (McConnell 2018). The Senator Ronald Lee Wyden tweeted in April of 2018: "Here's my bottom line on hemp. If you can BUY it in a supermarket in America, farmers should be allowed to grow it in America." (Brown 2018). Herein lays an important lesson for all interested in campaigning for hemp legalization - the importance of a wide network of propagators and allies, especially since there is something of a social stigma which needs to be dealt with via change of public and stakeholder perception.

Farmers aiming at the golden goose of hemp profits - CBD got some relief as well. After being treated as a Schedule I substance under federal law, hemp derived CBD now received an exception, and was legal, if: "the hemp is produced in a manner consistent with the Farm Bill, associated federal regulations, state regulations, and by a licensed cultivator. All other cannabinoids, produced in any other setting, remain a Schedule I substance under federal law" (Maguire et al. 2018). In order to make the distinction, the States are obliged to create "performance - based sampling", and the testing must be performed for "total THC" instead for the less restrictive delta-9 THC standard. The tests have to be performed by DEA-registered laboratories, starting 31st of December 2022. The States also have to prescribe remediation or disposal requirements for those plants which do not pass the THC testing i.e. test over 0,3% THC, as well as a "corrective action plan" for the cases where hemp program rules are infringed (Bodian et al. 2021).

Same goes for all CBD products with hemp origin in case the producer doesn't obtain the necessary USDA-issued licenses and those from state regulators. In 2020, CBD has been legal in 47 states as well. Just how important the CBD regulation is can be seen from the analysis performed by Jacobs in 2020 - only slightly over 6% of total 2020 acreage is dedicated to grain and fiber varieties, while the rest goes to cannabinoids.

In comparison to the 2014 Bill, the 2018 issue is not limiting production to pilot programs intended to study market interest in hemp products, nor does it put any limitations on possession, transport or commerce, again, as long as the proper licensing authorities have greenlighted the venture. Other moves have been made in attempts to bring hemp closer to the treatment that other agricultural commodities receive. The section 11101 for example grants farmers protections related to the Federal Crop Insurance Act which should in theory bring more predictability and security to hemp undertakings.

The 2018 Bill was obviously an additional boost to hemp farming, as the total area under hamp grew to 146,065 acres by mid-2019 with 47 states having passed legislation allowing some or another type of hemp production (Mark et al. 2020). The "Economic Viability of Industrial Hemp in the Unitest States: A Review of State Pilot Programs" report also reports that the largest acreage in 2019 was found in states which are not already leaders in production of other, conventional, field crops, like corn, cotton, wheat, soybeans, etc (Mark et al. 2020).

However, while enthusiastic hemp proponents might preach hemp's multiple benefits as undeniable, including the financial gain from its farming, despite being grown before, hemp should be seen as a new plant in America's market, and as such there are many unknowns, and therefore it is still far from a safe bet (Lucas 2020). Therefore, long-term trends are still hard to predict as there is a lack of reliable data and research, so increasing yields and number of farmers entering the market bring with them a lot of unknowns as to how will the demandsupply patterns play out. A case in point can be found in Colorado, where large interest and enthusiasm created an oversupply of the plant, only to see a steep price drop from USD 40 per pound to USD 10 in one year (between the summers of 2019 and 2022) (Drotleff 2021). Still, while there is a need for expectation management, this does not mean hemp is done, but that traditional market forces have to be taken into account and adding more uncertainty into the system are the effects of the COVID 19 pandemic. Some prognoses spell out a strong upward trajectory for hemp markets in the coming decade. A growth of 15,8% fort the global hemp industry is foreseen in the Grand View Research in the period between 2020 and 2027, during which CBD revenues alone should increase to USD23,6 billion from USD9,3 in 2020 (Industrial Hemp Market Size & Share Report, 2022-2030 2022).

Prognosis for USA alone, by the Wall Street firm Cowen & Co have estimated CBD industry to grow to USD 16 billion by 2025 (Azer et al. n/a) (Cannabidiol Market Growth Analysis Report, 2021-2028 2021). How exactly will the US integrate itself in the global market is key to successful predictions as well. Up until now, and even before the 2017 and 2018 legislation made lives easier for hemp farmers, US was importing hemp products. In 2015 the imports reached nearly USD 80 million. In 2017 this number went down a bit but was still close to USD 70 million. Close to ²/₃ of this went to hemp seeds, and most of imports, around 90% was from Canada (Nepveux 2018).

Another venue which could help farmers increase the prospects of hemp farming can at the moment be seen in artisanship as well (Quinton 2021). It is reported that high-grade hemp CBD flower fetches about USD 300 per pound. Otherwise CBD biomass in form of buds, leaves and stalks sells around USD 0.48 per percent CBD per pound (HempBenchmarks 2021).

As far as numbers go, hemp in 2021 shows a drop off, however the numbers are not conclusive as they might seem at first. The decrease was noticeable in 2020 as well, when the amount of acres dropped by 9%, according to research of the Hemp Industry Daily(Drotleff 2021). This is mainly attributed to a lack of regulatory uncertainty, the unused and stored 2019's flower and biomass, as well as the constantly decreasing wholesale prices. On the upside, the number of growers increased by 27%. Additionally, a further, more-detailed and methodologically coherent analysis is needed as well in order to get the exact data, in order to properly converge methodologies used in different reports. Some sources relied on numbers related to permits where only planned acreage is listed, while others used methodologies such as survey data collection.



Figure 7 Amounts of hemp areas licensed, planted and harvested across USA between 2019 and 2021. (New Frontier Data 2021)

The problem with the first method is that the applied acreage has in praxis often been larger than that truly planted, and further on varies even more compared to the acreage sawn, due to a score of issues which can occur and reduce yield. The latter method has its own set of issues, for example research done for the *Hemp report* (Vote Hemp 2021), published by Vote Hemp does not include all of the states growing hemp. A summary by Frontier Data provides an overview of Total acres licensed, Planted and Harvested.



Fig 8 Hemp grown across USA, in the open, in acres (Honig 2022)

Among the latest information on US hemp production found at the time of the writing of this thesis was that found in the "National Hemp Report", released by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, of the USDA, released on February 17th, 2022, referencing to 2021. The main figure of this report is the total industrial hemp value, which was estimated at USD 824 million, how those numbers translate to actual merchandise flow and profits for farmers is however a subject which also needs further exploration. Another report, the "2021 Hemp Outlook", by the Hemp Industry Daily, a specialized, hemp and cannabis -oriented outlet, reports that in September 2021, some 284,793 acres have been licensed. The report used data obtained from the USDA Farm Service Agency.

Next to the uncertain regulation landscape (primarily related to CBD, as it makes such a large portion of the market), the following have also been identified: underdeveloped and immature supply chain, low wholesale prices, surplus of hemp flower and biomass, as well as record-breaking droughts (in some cases for the fourth year in a row) (HempBenchmarks 2021). The aforementioned regulation landscape issues are not related to CBD production, which is fairly clear, but is on the consumer side, since the FDA is hesitant to prescribe hempderived CBD as a legal and safe an ingredient across the board. This is a debate which needs to reach a conclusion as soon as possible to stop hindering the growth of the market, however it needs to be scientifically informed and driven, not just purely profit and ideology motivated. According to this research, a 24% decrease in licensed acreage occurred, compared to 2020 data of USDA Farm Service Agency, which reported 375,000 acres, and an even bigger, 39% decrease compared to the 465,787 acres of licensed acres as reported by Hemp Industry Daily in 2020.

Seeing numbers for 2022 will be extremely interesting, among other reasons from the aspect of re-orientation, especially since judging by statements of several industry representatives, a noticeable increase was observed in farming for fibers as well as grain, due to consumers interest in plant-based protein (Drotleff 2021). Those numbers, as well as for the following years should bring much more clarity on the possible role of hemp farming in USA and USAs place in the global hemp markets, and will hopefully, with other factors and influences. shape a more hemp friendly policy landscape and thus economy.

4.3

he good, the bad and the lessons learned

Obviously, albeit a returning plant, hemp is a new economy with immature supply chains, unstable market and still adapting farmers, so the long-term viability of the hemp market in the States is still up for debate and depended on these and other actors. The "Economic Viability of Industrial Hemp in the United States" finds the following as key factors:

- "Competition from the more established European and Asian markets
- Competition for acreage from conventional crops
- The ability to fine tune production to meet demand and avoid large pricing fluctuations
- Continued market development" (Mark et al. 2020).

The state and relevance of the international markets will be presented in another chapter, as far as the possibilities for RS are concerned, a detailed analysis is beyond the scope of this thesis, but certain aspects will be addressed. The second and third point are related, in the way that, while no market is 100% stable, the American example is a dire warning regarding the necessity for expectation management which is key in strategic planning in cases like this, where longterm analysis and trends are not available. In the case of RS, due to an abundance of unused agricultural land it is not a competition for land as much as for farmer's attention and investment, since hemp, might promise larger prices, but the case of US seems to show that the stability of traditional crops with developed supply chains is more attractive, as hemp acreage grew slower in states where there was already a strong presence of another traditional crop, such as corn, soybean, wheat, cotton, etc (Mark et al. 2020).

Decreasing risk might indeed be one of the main challenges in a newly starting hemp economy such as RS. A unified approach might help offset the risk of potentially risky decision making, whereby e.g cooperative approach would spread the economic consequences of failed harvests or poorly placed products across several actors, instead of just one. This approach could become a standard or only serve for a while until the markets and supply chains are formed and made less risky.

While this short overview might not do justice for the things done right in the States, the glaring mistakes speak volumes about the importance of a thought-out establishment and expansion of strategies, markets as well as infrastructure for profitable hemp farming. Public and stakeholder buy-in is necessary as well to ensure public sector support, where available, in line with the support other agricultural commodities receive.

The necessary public sector/government support is not only limited to financial grants and loans, but should extend to an openness and willingness to a fact-based and efficient dialogue with farmers and hemp market stakeholders in order to make certain the legislation

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follows the newest market trends, as well as scientific findings, e.g. health effects of hemp products. Founding of cross-cutting associations, comprised, or at least supported by not only farmers, but other hemp market actors, as well as policy and law experts, economists, scientific workers as well as political and public sector representatives, can not only make the topics related to hemp more visible on everyone's radar, but can enhance the exchange of information, attraction of investment as well as a wider reach to the general public. The work pointed toward hemp actors should aim at providing the most up-to-date knowledge on economic perspectives in order to avoid the consequences seen in the States, as well as technical knowledge aimed at obtaining the best possible agro-technological knowledge in order to minimize crop loss, and optimize all processes involved.

Such a coalition will also be better equipped to undertake a public campaign necessary in order to introduce not only the importance of the plant, but also to dispell all negative connotations, ont only to create a market for hemp products, but also to minimize negative occurrences, such as crop destruction or theft, which has been observed in USA (Adams 2019). A strong campaign pointing out the difference between hemp and marijuana will contribute to dispelling the forbidden apple effect and should decrease crop theft. This way not only financial loss and psychological and physical toll of night shifts guarding crop could be decreased, but safety of both farmers as well as thieves would be insured, as conflicts, including physical altercation, can easily take place in such scenarios.

A unique threat to successfulness of farming in case of hemp are the THC regulations. A venue addressing the threat of THC level overstepping due to natural causes (environmental stress, genetic composition of seed) is increasing the THC limit allowed to appear in testing. Another is creation of insurance schemes where in case of increased THC the farmers can get reimbursed for the amount of destroyed hemp.

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Another possible antidote to insecurity of the market is a well-functioning, efficient, accessible and quality data management on all hemp market actors. In the States, the varying and inconsistent data has been identified as an important obstacle, which at times led to producers struggling with finding buyers, even though the processors themselves had problems identifying and contracting hemp sources at the same time (David W. et al. 2020). Here, the nature of BiH's bureaucratic set up should be considered, and any database developed in RS should be coordinated, if not shared, with the rest of the country, if not wider. Additionally, the datasets should consider the issues experienced in the States, such as the differences between licensed, planted and harvested amounts of hemp, as well as other data, in order to help inform future decision making across the board, from fields to policy meetings.

According to the Jacobsen report, the largest part of US hemp is managed organically, and certification was rapidly expanding among those not certified already. This is, among other reasons interpreted as a bid to enter the organic market which achieves higher prices for the final products, and attracts "market participants looking for marketing advantages". At the same time, hemp itself is an excellent addition to crop rotation due to the benefits it has for soil structure as well as in interrupting pest cycles. Further research should be taken into the matter, but if exporting of hemp consumables is to be a course taken by RS produces, organic certification and production is a direction worth serious consideration.

4.4 Hemp in EU

Hemp farming has a long tradition across the European continent, and was at its peak in the times prior to WWII. The 1930s Russia was growing it in an area close to 700,000 he, providing for 40% of Europe's needs, while Italy and Yugoslavia had some 100,000 he between the two of them (EIHA n/a). The farmed surface in the EU has increased from 19,970 ha back in 2015 to 34,960 ha in 2019, equaling up to a 75% increase (European Commission n/a). The amount produced is consistent with the increase of hectares as well, with 94,120 tons in 2015 and 152,820 tonnes in 2019, amounting to a 62,4% increase. The rise in these numbers is even more impressive once compared to the 1990s, since it makes a 614% increase compared to 1993

figures (EIHA n/a). Today EUs hemp industry is mostly self-reliant when it comes to raw material, since some 90% of it is sourced from within Europe.

According to a 2018 survey by EIHA (Mirizzi et al. 2018), more than 50% of leaves and flowers traded in EU is used for the production of food supplements, among them CBD extracts as well. Fiber production is limited due to lack of supply as well as of manufacturing facilities and the relatively high price of raw materials. Among the main facilitators of this growth was an extremely fast growing consumer curiosity for hemp products whose number grew in a relatively short time (Francesco 2020). The same seems to have happened as in the States and elsewhere - the markets as well as farmer's and consumers interest in hemp and its products developed at a pace much faster than that of policy development, which, as is also seen in the US chapter, brought with it a score of issues for hemp stakeholders.



Fig 9 Use of hemp flower and leaf in the EU (Mirizzi et al. 2018)

The largest hemp producer in EU is by far France making up to 70% of EUs overall production, and is the world's third producer (Omnes 2021), following China and Canada (Mcgrath 2019). Other big producers are Netherlands which makes up 10% of production and Austria with a 4% share.

Much like the States, several EU members also imposed bans on hemp cultivation at one point. And while the 1970s saw some development in this aspect when the, then known as European Communities, created a regulation dedicated to organizing the European flax and hemp markets (Council Regulation (EEC) 1308, 1970), hemp development was still stifled in legislation in many of the block's members. At the time, hemp production was still mostly limited to France which never made hemp illegal, up until the 90s, and this can be seen in today's production numbers. However, where national laws allowed it, there were options for EU subsidies. These subsidies were, as is policy elsewhere also subject to conditionality (Young 2005). In order to apply for them the following restrictions were in place (Council Regulation (EC) 1420, 1998):

- Hemp seeds had to be of certain cultivars, certified and from an EU-approved list
- The cultivar had to content less than 0,2% of THC
- Harvest has to take place after the flowering period is finalized.

The last point posed an additional issue for all interested in fiber crops, as it negatively affects both quality and quantity of the fiber, thus reducing the crop's value (Bocsa et al. 1998). The major point of contention is of course the aforementioned THC level, as the relatively strict 0,2% level greatly shortens the list of eligible varieties. At one time the EU looked to improve on the situation by sponsoring a program dedicated to breeding low-THC hemp varieties, which took place in France, Netherlands and the UK (Matthews 1999).

The 2013 Common Agricultural Policy (CAP) didn't make life much easier for hemp farmers either. The 0,2% THC limit pertained, for both growing and importing hemp. In order to import hemp, the importers would have to stay in line with the EU Regulation 1308/2013, Article 189 (European Commission n/a), meaning that they would have to obtain an importing license and stick to the following prerequisites when choosing their product: "raw true hemp falling within CN code 5302 10 must have a THC content not exceeding 0.2%"; hemp seeds for sowing also must be accompanied by proof that the THC content of the variety concerned does not exceed 0.2%; hemp seeds not used for sowing may be imported only under the authorization of the EU countries, and authorized importers must submit proof that the seeds have been placed in a condition that excludes use for sowing;

EU member countries may also apply more restrictive rules in line with EU treaties and international obligations".

Additionally, under the CAP, hemp farmers are also eligible to apply for area-based direct payments. Next to the standard conditions that all farmers are obliged to abide by, hemp farmers also have specific requirements for hemp, which are in place to make sure that only the legally - permitted crops receive any CAP support. Additionally, EU member states can further help hemp farmer by granting them via the voluntary coupled support (VCS), which is currently taking place in Poland, Romania and France.

Additionally, hemp farmers can use support from rural development measures which are a part of the CAP's second pillar. These support measures are designed in order to "facilitate investments, knowledge-building, business start-ups, innovation, supply chain organization, organic farming, environmental protection and climate action". In this manner, despite having additional measures and obligations, hemp farmers inhabit the similar policy and bureaucratic space that farmers dealing in other crops do.

A breath of fresh for hemp farmers came in 2021, more precisely on December 2nd of the said year, when the final proposal of the new Common Agricultural Policy was adopted by the Council, after the European Parliament voted on it on the 24th of November (EIHA 2021). It enters into force on the 1st of January 2023. A major development which took place is the increase in the allowed THC presence, from 0,2% to 0,3%. It is important to note that these THC levels were only obligatory if farmers were to apply for EU support via direct payments. If not, higher levels were allowed, but only if so stipulated in national legislation. Thus, farmers in Italy can grow hemp containing up to 0,6% of THC, while those in Czech Republic and Switzerland can go all the way up to 1%. It is also worth noting that 0,3% was actually not a new policy per say, but rather a revert to old, since in the time period between 1976 and 1999 hemp production THC limit was 0,3% (dry weight basis). The decrease to 0,2% was created with intent to fight cultivation of marijuana in industrial hemp farms, but the efficiency of this policy measure has not been proven yet by any data or evidence (CAP Reform 2019).

In order to comply with the THC percentage limitations, farmers in the EU are limited to using certified seed varieties which are listed in the EU common catalog of varieties. Before the increase of THC from 0,2% to 0,3% the list contained 75 different varieties. Different sources believe that this increase could expand the list to 400 (HFI 2021) or even 500 new varieties (CAP Reform 2019). Either of the two opens the opportunities for introduction of new cultivars which can potentially be better equipped in terms of disease and environmental resistance and climate adaptability, while potentially introducing shorter harvest intervals, more robust fiber, higher-quality grain and flowers as well.

The communication between the Commission and stakeholders related to hemp, as well as other fiber crops such as flax and cotton, is maintained via the Civil dialogue group on arable crops (European Commission 2020).

The European Commission itself is open in its recognition of hemp's potential. On its dedicated website, among other information it included the plant's importance and contribution for the objectives of the European Green Deal (European Commission n/a). The contributions are described under the following categories: carbon storage, breaking the cycle of diseases, soil erosion prevention, biodiversity, low or no use of pesticides. Hemp is mentioned in official sustainability/environment/climate related documents as well, such as the December 15th 2021

Communication from the Commission to the European Parliament and the Council on Sustainable Carbon Cycles. In the chapter "A sustainable bioeconomy", it is, together with flax and other fiber crops categorized as a source for "innovative carbon storage products". This position is in line with the narrative that the hemp-promoting organizations have been introducing into the hemp discourse for years. On February 2021, in its address during the Meeting of the Civil Dialogue Group Arable Crops (cotton, flax and hemp sectors), the EIHA representatives urged the Commission to "extend the scope of the European Raw Material Alliance to biobased alternatives to extractive materials", as well as to remove viscose from the application of the single-use plastics directive (which was also requested by other European trade associations) (European Commission 2020). These are important policy steps in opening space for new hemp markets as part of a cross-sectoral green transition. Hemp's importance was once again recognized by the European Commission on April 26th 2021 during a meeting on Europe's climate policy objectives, where a special emphasis was given to EU CAP and the Farm to Fork strategies (HFI 2021). The EC highlighted the potentials that the numerous uses of hemp create, and concluded that "all elements are interesting and important to discuss when we consider EU hemp production.", as well as that Europe "must be much more aware and understand the links with the positive environmental benefits when we look at the EU objectives in the CAP and Farm to Fork strategy".

4.5 Case study France: Power to the people – the advantages of a cooperative approach

France is the third largest hemp producer in the world, and definitely the largest in EU, as previously written. Not only did France never opt for making hemp illegal, but the recent market developments, primarily the CBD rush, have fueled another growth spurt.



Fig 10: Amount of hectares under hemp in France 1961-2019 (FAOSTAT 2022)

The first major increase of hemp production came in the late 1970s, thanks to paper industry. Despite the Europe-wide and global decline, caused by the rise of petrochemical industry and the synthetic fibers, as well as cotton imports, hemp had a safe haven in France. However, the hectares dropped significantly, from 176,000 in 1860 to 700 in 1960. The French National Federation of Hemp producers is still among the oldest French agricultural organizations, which was founded in 1932. Most of hemp production takes place in the north - eastern part of the country, in the Grand Est region, which has historically been a major hub for hemp farming and related developments. It is also home to the "la Chanvrière", an agricultural cooperative which started in 1973, and rounded up over 50% of the 450 cooperative farmers working with hemp. While primarily growing for paper, in the second part of the 1980s "la Chanvrière" turned to horse bedding market (starting the brand "Aubyose"), and in the 1990s they entered the market of building materials (such as hemp concrete, also known as hempcrete) and today they also also present in the insulation market as well as mulching and composting materials (La Chanvriere, 2022)

An interesting point in the development of the cooperative took place in 1987, when a production agreement between the cooperative and farmers was introduced, one which stipulated those payments shall be linked to quality of hemp delivered. Following that development, the amount of land used for hemp farming continued increasing. The exact effects of this decision are not clear from the sources gathered during this research, but should be further investigated, albeit in modern times this is a common practice in agrology, e.g. in fruit farming and commerce.

Looking to find further markets, La Chanvriere expanded its operations, assets and resources. In 1998 they founded "Construire en chanvre" (Build with hemp), which subsequently created AFT Plasturgie, which worked on developing hemp fibers to be used in reinforcing plastic applications. In 2003 the cooperative also founded "Interchanvre" and the "Institut Technique du Chanvre", in order to create a space for industry among the hemp farmers and processors. They did not stop there, and in 2007 founded the "Fibre Research Development"(FRD) in order to create "a real interface between the farmers and process industries".

They took an extra step of investing in their own production and packaging equipment, therefore closing the loop for B2C and B2B operations for several of their products.

The latest undertaking is still under development - together with the tech company Cretes (part of the farm equipment supplier "Union nv machines"), La Chanvrière is developing a specialized hemp harvesting machine. The machine's main role will be to harvest the crop in a way that would produce stalks of consistent length, ready for processing in the textile industry, straight from the field. Since the high-cost of specialized equipment is among the major capital expenses for hemp farming, and adaptation of already existing agriculture machinery requires technical know-how and tools, ventures such as this one can present a major improvement of hemp farmers' overall profits. The Cooperative model is one to take into serious consideration as it is one of the possible way of improving the sustainability of farming practices, while decreasing risks. In the case of La Chanvriere it was used to create a unique hub which pulled resources in order to create a one-stop-shop for its members, where production, processing, marketing, together with skill sharing and development as well as research and development which led to opening of new markets and maximization of investments. This, coupled with numerous farmer members as well as the quality criteria for raw materials creates a steady and dependable supply chain of quality products, inspiring trust among customers.

As for the environmental and societal impact, the La Chanvriere website claims that the cooperative is committed to its Corporate Social and Environmental Policy. This is a good development in regards of hemp farming sustainability as it could potentially attract farmers who on their own would not necessarily be drawn to sustainable farming practices e.g. agroecology. However, the allure of guaranteed sales and other means of support a cooperative might grant might sway them in the sustainable direction.

Next to guaranteed sales, the farmers benefit from knowledge transfer in relation to optimal agricultural techniques for optimal yields. All hemp farmers in the cooperative sign 5-year contracts on straw production, with the quality-conditioned payment clause. This creates a steady influx of quality raw material for the processing plants, which in turn create a regular supply for the final customers. Just how regular the supply is is best illustrated by the information that La Chanvriere can process and place on the market 50% of France's hemp production and 30% of EU (PRODUCE AND PROCESS 2022).

The cooperative's description also claims that environmentally friendly farming is practiced, with biodiversity and ecosystems in mind, using zero pesticides use and no irrigation.

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4.6 Case study Ireland: Old taboos and lack of representation

Like elsewhere in Europe, hemp has been a constant in Ireland for well over 1000 years, among oldest hemp-related artefacts being a piece of cord, founded in the city of Dublin and estimated to be some 850 years old. Its growth and use was common up until the mid 1900's, much like the rest of European continent. It was also researched early on – for example, University College Cork worked on researching properties of hempseed oil in the 1930's.

LOOP-NET SALMON FISHING

SUPPLIES OF HEMP EXHAUSTED

Unable to obtain hemp for the making of their nets, twenty-five families in the Bonagee area of Letterkenny are faced with the prospect of having to abandon a means of livelihood they have followed for generations. Since the commencement of the war it has been increasingly difficult to obtain supplies of hemp, and this year, with no hemp at all available, it seems that these fishermen must look for other employment. The Bonagee loop-net fishermen operate on the estuary of the Swilly below the Thorn, their season being from the beginning of April to the middle of July. Their catches of salmon-the only fish for which they seek-are always considerable, and in the war years, with salmon reaching peak prices, their profits have been far beyond anything ever experienced.

Fig 11: Excerpt from the Donegal News, April 1943 (History 2018)

Again, much like in other countries of the EU, 1990's saw Ireland growing hemp once more. The fields under hemp began growing, making a 700% increase in production area between 2017 and 2019, growing from 76 hectares to 547 hectares (Hemp Federation Ireland 2021). However, judging by the grievances of Irish hemp farmers associations, after a promising increase in hemp farming, the policy landscape took a turn for the worse. The effect this had on hemp farming was visible relatively fast, with a successful 2019 being followed by a 40% drop in amount of farmed land in 2020.

The newly imposed changes were met with heavy resistance from hemp farmers and organizations, such as Hemp Federation Ireland (HFI). This non profit, national organization gathered stakeholders from the entire lengths of the value chain, from farmers to processors and retailers, distributors, food and seed business operators and suppliers, construction specialists and agricultural scientists, health and permaculture experts, etc. The HFI claimed that by changing the legislation in a manner which prevents farmers from using the whole plant, the Department was cutting the hemp farmers' profits from EUR 3,000 per organic acre when the whole plant is available for processing, to a mere EUR 450-600 when only stalk is legal.



Fig 12: An estimate of potential profits from hemp in Ireland, by plant parts (Source: Hemp Federation of Ireland).

According to HFI's director, Chris Allen, the root issue of the confusion came about once the primary responsibility for the agricultural hemp was delegated to the Department of Health (Oireachtas 2022). In doing this, hemp or industrial hemp discussions were framed as a part of the medical cannabis debates and legislating. Adding to that, the HFI director claimed that since 2018, all new legislation related to hemp was developed not only without a proper public and stakeholder participation or subsequent explanation, but that in doing so it was also suspending Ireland's observance of EU laws in direct and indirect ways, steering all conversations away from the agricultural and environmental potentials of the crop". According to HFI, analyzing the records of the Oireachtas, starting with 2019, official representation of the hemp industry by Irish Ministers for Agriculture changed suddenly and dramatically., and that hemp food produce is completely removed while the Misuse of Drugs Act was invoked for the first time, as well as terms "strictest levels of control" Such a turnaround in policy and language, according to Chris Allen, brought upon a rebranding of hemp to cannabis i.e. from an agricultural commodity with great potentials for the benefit of farmers and the environment, to an illicit or legal drug, no more under the auspices of the Department of Agriculture but the Department of Health.

The HFI goes to explain that in their operations, it is the food value of the hemp plant which is both the main economic driver and environmental value, and it is for this reason that, according to the HFI, that "a whole plant approach to development, in line with undisputed science, is fundamental to securing the interdependent environmental, human health, and socioeconomic potentials of the industry". Adding to that, with the legislation as it is now, farmers are forced to destroy the hemp flowers(Kennedy 2021), therefore losing out on the precious cannabinoids, primarily CBD and the profits it could bring.

Another major grievance expressed in the letter was also an ill-managed policy development process and a poorly conceptualized consultation framework, which not only excluded farmers and associations from participating, but also overlooked major, yet basic questions, such as supply chain economy and the impact such limitations would pose on it. In their September 23rd 2021 letter to Secretary General of the Department of Agriculture, Food

and the Marine 23/09/2021, the HFI wrote: "No mention of the unique nutritional value of our agricultural foods is permitted and no mention of highly problematic Irish policy dynamics related to agricultural hemp food production in Ireland is allowed. Of greatest concern to us is the framework's exclusion of any possibility of accurately representing the actual environmental value of the industry in the wider context of climate change, land-use management, and food sovereignty and security." (Allen 2021).

The HFI further reminded the Secretary General that such practice isn't present in national legislation of any other EU member, nor is it the norm of the EU legislation. It also quoted the 2020 ruling of the European Court of Justice (ECJ), whereby no Member States can through enforcement of their domestic drug laws restrict hemp and hemp-derived products across the European Single Market (CURIA - Documents 2022). The ruling also confirmed the right of all EU farmers to use the hemp plant in its entirety (including flowers and leaves), and that all of these parts can be used in marketing foods of agricultural origin, including CBD. Adding to the losses described above, come 2020, hemp farmers were also excluded from agricultural support schemes, State enterprise support, including Covid-19 support schemes as well (Oireachtas 2022). Only ones who had access to such funds in relation to hemp crops in Ireland were pharmaceutical companies.

Further obstacle, mentioned by farmers is the fact that a permit for hemp growing needs to be applied for on a yearly level, with the Health Products Regulatory Authority (HPRA). Next to the procedure on its own requesting time and effort, the HPRA is, judging by farmer's experiences not well equipped to deal with the increasing number of applications. In one interview, cases were mentioned where farmers would receive the requested licences only in August, in time when harvest should be well underway, while sowing should have been undertaken in May. While the cooperatives have been assisting farmers with their applications, only having one person dedicated to processing applications is extremely limiting. Some farmers have suggested development of 5 - year licenses which would be much less of a deterrent for those interested in hemp farming (Kennedy 2021).

Adding to that, the potential profits are made smaller due to the 0,2% THC limitations which for the consequence has the fact that no feminized variants are available among those in the current catalogue. CBD can only be produced from feminized plants, according to interviews, having such variants, where the whole crop is feminized, could potentially increase farmer's earnings from EUR 3000 to EUR 20 000. Currently, the European Seed Database only contains one type of seed – Finola, which could be feminized, but the copyright owner has not yet done so, for reasons yet unknown. The upside is that with 2023 the new CAP will become operational, thus allowing more variants to be added to the market.

A similar issue occurred in Sweden as well, where a struggle is ongoing with Swedish hemp stakeholders fighting the proposed changes to legislations which threatens to render legal only the use of stems and seeds, thus significantly reducing the profitability of the plant by exclusion of the lucrative plant flowers (HEMPTODAY® 2022). The initiative for this change came from the Ministry of Social Affairs, and is, according to official statements, a result of an increased workload which hemp related processes created for country's agencies, which created increased expenditure for the budget of the government. Furthermore, it was reported by officials of the customs, police, medical, agricultural and food and safety agencies that a lack of legal certainty surrounding hemp has introduced additional complexity in their work.

Limiting the use to certain parts of the plant is detrimental to farmer's profit, as well as to achieving the most from the plant, as it prevents the complete unlocking of its full potential across the markets related to biomass, medicine, food, fiber, construction, bio composites, etc. Another limitation in the planned changes is the introduction of a minimum land plot for hemp farmers. If adopted, the new rule which requires individual growers to plant no less than four hectares would, according to SIHA, greatly restrict and deter small-scale producers, both those looking into commercial gain, but research and development projects as well.

Key recommendations of this association were general treatment of hemp which is in line with treatment of other agricultural crops, including handling, preparation as well as marketing, for all parts of the plant. In further recommendations, liberalization was suggested in regards to use of CBD and other cannabinoids in food and dietary supplements, introduction of origin labeling and traceability elements for imported, both raw and processed, hemp, in order to provide for more informed decision-making by the consumers

Finally, a note was made on the necessity for further research into heritage seeds of hemp, primarily the varieties which have been developed by the Swedish Seed Association during the 40s and the 50s, as a means of propagating well adapted, native varieties.

4.7 Case study Serbia

Hemp farming is legal in Serbia, which is defined by the Law on psychoactive and controlled substances² and the Rulebook on Conditions for Hemp Cultivation³. Article 3 of the Rulebook stipulates that has far as seed oil is concerned, in Serbia it is legal for animal food and for humans as an external ointment. hemp can be grown for the purposes of:

- Fiber production
- Seed for Livestock feed and processing
- Testing of seed material
- Production and commerce of seed.

The rulebook also stipulates that the permit shall be given out for a length of one year, and that the seeds from the dedicated list can be use, containing no more than 0,3% THC, much like in

² Zakon o psihoaktivnim kontrolisanim supstancama Srbija (Officiall gazzete of Serbia, number 99/10

³ Pravilnik o uslovima za gajenje konoplje: 64/2013-13, Official gazette of Serbia, number 99/10

the EU. However, despite there being over 70 variants which are in line with this demand, only three are currently allowed in Serbia. The minimal size of land cultivated for hemp is 0,5 hectare.

Organization *Konoplja*⁴ was founded in 2015, in order to gather small hemp producers, increase their financial and environmental sustainability, create new jobs and provide services such as seed distribution and education. In 2016 a cooperative in that name was registered as well. At the time, Serbia had some 60 hectares under hemp, this number drastically increased in the following years with somewhere between 250 and 300 hectares under hemp.

The hemp-rush in Serbia, similar to that in the States and elsewhere, was followed with exaggerated promises of profit as well. Estimations of up to EUR 70,000 per hectare were claimed by different enthusiastic propagators, mostly related to CBD market. The team behind "Konoplja" has also been working, via seminars, media and social media to dispel the false assumptions regarding this issue, while educating the interested and general public on real possibilities, next to the technical aspects of hemp farming and markets.

⁴ "Konoplja" is the Serbian word for hemp

Expense category	Expense amount	Hemp product	Yield (t/ha)	Revenue/ton ne	Revenue/ha
Land loan	400 EUR/ha (optional)	Seed	0,4-1,2	1,000	400-1,200
Land preparation	300 EUR/ha	Flower and leaves	0,4-1	3,000-8,000	1,200-8,000
Fertilizer	220 EUR/ha	Stalk ⁵	8-12	50-80	400-960
Seed	160-350 EUR/ha	Combined			2,000-10,160
Machine picking	220 EUR/ha				
Transport	100 EUR				
Drying service	100-200 EUR				
Selector(separationseedsandflowers)	350 EUR/tonne				
Labor	100 EUR/tonne				
Lab. analysis	80-100 EUR				
Total investment	1630-2330 EUR/ha				
Potential profit per hectare					370 EUR - 8,530 EUR

Table 4 : A rough estimate of potential profits from hemp farming in Serbia (Source:(Gramina Konoplja 2020)

Taking into consideration that profit from corn in Serbia in 2020 was no more than EUR 1,400 per hectare (Jovanović 2022) (not taking cost of labor and land rent into calculation), even without the exaggerated figures, there is still plenty of motivation for farmers to turn towards hemp, especially when the "whole plant" approach is utilized. Another great influence on the profits of hemp farmers is the seed variety choice. The allowed varieties in Serbia have

⁵ The calculation for stalk was done under presumption of stalk being sold as raw resource. If processed into fibers at the location, with the use of a decorticator, it can be considerably increased.

comparatively low CBD percentages, which means that in order to create a higher potency product more biomass needs to be utilized, therefore decreasing the potential profit. Currently legal varieties UHelena, Monoika and Fedora17 do not contain more than 2,5% of CBD. If policy related to allowed varieties was to change, the calculation shown in the chart above could increase significantly. Finally, if decorticator machines were more available to farmers, the profits from stalks would increase as well. For the purpose of this thesis, several interviews were planned, however due to a string of reasons none of them took place in that form. However, some of the potential interviewees did provide limited information relating to the questionnaire, one of them was a representative of both the Konoplja cooperative and of a venture registered after, called "Gramina".

After "Konoplja", a venture named Gramina was founded by the same group, in order to continue the work and sell final hemp products, still motivated by the numerous potential applications hemp has, and the environmental improvements it offers as a substitute for otherwise polluting resources and products, such as plastics. The interviewee summarized this position by calling hemp the "only plant which can feed, cloth, dress and house".

Gramina sells a wide variety of products and has registered a branch in the USA, where they export a part of their products. At this point, the crew behind "Konoplja"/"Gramina" has 7 years of experience with hemp in Serbia, and have amassed considerable experience in all aspects of hemp, however the beginnings have admittedly been difficult, since they were among the pioneers. In 2020 the cooperative gathered 80 hemp farmers. They invested, and keep investing considerablef effort in awareness raising, but despite an increased visibility and popularity of hemp, there is still a strong amount of negative preconceptions in relation to the plant.

The latest hit reputation of hemp took was the "Jovanjica" (Jovanjica Archives 2022) controversy, when marijuana was found on a farm registered for industrial hemp. The

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proceedings are still ongoing, and high-level corruption allegations including police officers and politicians were put forward by investigative journalists. This case will continue to echo in all debates about industrial hemp and will undoubtedly influence people's perception. The interviewee reported that following the case the phytosanitary inspections have become more frequent as well as stricter. No cases of crop theft like those mentioned in the USA case study have been recorded, however there has been one occurrence where a neighbor reported a hemp farmer for growing marijuana, which caused some inconvenience for the farmer. This is most probably one of the reasons why Gramina advises hemp farmers to, next to submitting the obligatory documentation to inspection services and the relevant ministry, also pay a visit to their local police station and inform the staff about their undertaking in advance. On the financial side, the interviewee was well aware of the amount of over-exaggeration when it comes to hemp profits and confirmed that such cases did happen in Serbia as well. They do not see or advertise hemp as a foolproof crop or suitable for those solely focused on fast money, since "agriculture is uncertain and nothing can be surely foreseen, as one year can be good, but the next can fail, due to weather or any of the many reasons".

During 2019 a strong battle was fought over the new law on drugs, which threatened to outlaw CBD to all but very specific pharmaceutical uses. The hemp associations and farmers put on a strong front, quoting the recommendations of WHO and the European Medicines Agency to put CBD into the category of medicinals which don't need doctors prescriptions and even requesting that the head of the commission for the issue be changed. This request was also supported by the Green party(Strika 2022). This is yet another example of the necessity for any pioneering hemp farmers to hold ranks as at the current state of affairs working with hemp is not going to be exclusively farming, but a lot of paperwork, lobbying and crisis management. It is for this reason, as well as the standard economic which other branches of agriculture also have, that cooperative approach seems to be irreplaceable in case of hemp. CBD in Serbia is still in a gray zone, since its not completely regulated and Gramina is working on introduction of necessary changes in the Law on psychoactive substances as well as the Food Safety Law in order to make its production and commerce easier. However, they still manage to both produce and sell, as well as export both hemp oil but also CBD products, processed as well as raw seeds and flowers, ranging from cosmetics to food supplements, for humans and pets.

One incredibly important role of the cooperative, which helps farmers bypass some of the restrictions, is that the cooperative signs sales agreements, one of the propositions for a farming permit. However, these contracts are not binding and the cooperative and the farmers can trade if the quality is suitable for the cooperative and the price is acceptable for the farmer. However, the cooperative does not prevent farmers from pursuing better prices, but it helps them have one issue less while gaining their permit. The cooperative charges a one year fee with two separate possibilities. Those who decide on the "Basic" package (EUR 100) have to provide for and submit the necessary documentation on their own, however they can attend workshops free of charge as well and use the help of resident experts throughout the season. In case of the "Premium" package (EUR 200) the farmers only deliver the documentation to the cooperative, which then continues with the submitting, as well as all of the subsequent communication with the relevant bodies, including the inspectorate agencies. They also receive free attendance at all educational workshops and the assistance throughout the season. Additionally, they will receive regular updates on reports they need to submit, and help drafting them, before sending the final versions to the Cooperative which takes care of forwarding it to the necessary addresses in inspectorates and other locations.

4.8 Republika Srpska – an overview

RS is one of the two entities comprising BiH, the other being the Federation of Bosnia and Herzegovina. While being a part of BiH, RS also has its own National Assembly and Government, and is divided into 64 municipalities. For a large part, entities are self-governing and most of the legislation and strategy is made at this level.

RS is land-locked, it covers the northern and easter part of BiH and borders Croatia, Serbia and Montenegro. According to the 2013 census, its population is 1,228,423 (Brčko District not taken into account), with the population density of 49,9 inhabitants per square kilometre. As such it comprises 48% of BiH territory and is host to some 35% of its total population (RS Institute of Statistics 2016). However, the population numbers are estimated to be much lower in 2021, as brain drain and negative birth rate are chronic issues in the whole of Bosnia and Herzegovina (Agency for Statistics of Bosnia and Herzegovina 2019), and the region. According to a 2019 research study, some 530.000 citizens emigrated from BiH in the period between years 2013-2019. The UN classifies Bosnia and Herzegovina as an uppermiddle income economy, with RS nominal GDP per capita at BAM 9,795 (EUR 5,023) in 2020 (Datahelpdesk 2021).

BiH is a predominantly rural country, with rural areas covering around 95% of RS territory (Puška et al. 2021), with 25,005 registered farms, covering 129,137 ha, out of that 24,504 family farms. The total area of agricultural land of all types in RS is 1,250,000 hectares, approximately 1 ha per capita, which is above the world average. Arable land and gardens lead with size, followed by pastures, meadows, orchards, and fishponds. However, land of higher quality classes is not as abundant.

Around half of family farms across BiH have an average size of about 2 hectares, while 80% of farms overall are no bigger than 5 hectares (Family Farming Knowledge Platform: Bosnia and Herzegovina 2021). When it comes to organic farming, BiH is doing poorly, with only 1,273 hectares or 0,1% of overall area in 2019 being farmed organically. Still, this is a considerable increase when compared to 343 ha in 2011 (Mujčinović 2017). Most organic farmers in BiH sell around 75% of their products on the domestic market (Mujčinović 2017). The structure of farms is often divided across several parcels that are frequently distant from each other. Most of these family farms are mixed production, focused on securing various household food requirements.

Organic farmers associations are relatively young: The Organic Producers Association of FBiH, founded in 2019 and gathering some 2,000 producers (Šeremešić et al. 2021), and The Association of Organic Producers and Processors in RS, founded in 2015 with 50 certified producers in its ranks.

Overall, the descriptions of rural parts of BiH paints a picture of weak social and economic situation, characterized with a deficiency of employment opportunities and rife with brain drain and outmigration. However, agriculture is still an important part of the RS economy, as well as of BiH in total. In RS its part of GDP comes up to 10%. According to Mujčinović et al. 17,9% of BiH's population were employed in the agricultural sector (Mujčinović 2017), but it is safe to assume that the number is considerably larger due to the informal economy, as more than half of rural households take part in agricultural production, mostly, up to 90%, for their own consumption and the rest for revenue (Family Farming Knowledge Platform: Bosnia and Herzegovina 2021).

Additionally, the soils and land in general is overal not used in a strategic and responsible manner, while in many locations various types of degradation can be found, including infections and contamination, general degradation and destruction such as through construction and industrial processes, development of roads and other types of infrastructure, erosion and landslides, as well as presence of explosives, primarily landmines.

RS is also rich in forests, which covers around 44% of its territory, which makes it stand when compared to the rest of Europe. However, poor management is present in this sector as well, with rampant illegal cutting in line with the cross-sectoral practice of irrational resource exploitation. In so far, judging by the Strategy for the Development of Agriculture and Rural Areas of RS between 2021-2027 (Ministry of Agriculture, Forestry and Water Management 2021), no major conflicts between the forestry and the agricultural sectors have been registered (Government of RS 2021). This is partially due to decreased economic activities, however when it comes to other branches of economy, such as wood export, energy, conflicts are arising and increasing.

When it comes to climate, RS is located in the northern temperate area with climate zones: RS is located in the northern temperate zone (Government of RS 2008), and three climatic climates can be distinguished:

- Mediterranean, with variants of standard and modified Mediterranean climate.
- Mountainous, with an abundance of snow in the winter, and pleasant and cool summers.
- Continental, with variants of temperate-continental and continental climates.

This translates to abundant options for hemp cultivation, with one harvest per season/year. On RS level, the institution in charge of agricultural issues is the Ministry of Agriculture, Forestry and Water Management. The Ministry is divided in 5 sections: Department of Agriculture, Food Industry and Rural Development; Veterinary department; Department of Forestry and Hunting; Department of Water Management; Department for Providing Professional Services in Agriculture.

Under the ministry's auspices are also several executive organizations and institutions, such as the Agrarian payments agency, the Unit for coordination of agricultural projects, and other. This scheme will however have to be updated as a part of the EU accession, as there's a lack of bodies dealing with analysis, fisheries, EU integration, food safety, etc.

While there isn't a similar ministry on the state level, a part of relevant jurisdictions are on the Ministry of Foreign Trade and Economic Relations of BiH (MOFTER), as well as the, state-level Veterinary office, Plant Health Protection Authority, Food Safety Agency, Animal

Labeling Agency, Office for Harmonization and Coordination of Payment Systems in Agriculture and Rural Development, and Border Veterinary Inspection. While

BiH has "potential candidate country" status when it comes to EU accession. It is currently a part of the Stabilization and Association Process (SAP). SAP made available preacession funds to BiH, but it also brought a liberalization of trade between EU members states and BiH. BiH is also a member of the Central European Free Trade Agreement (CEFTA), it is not a member of the World Trade Organisation (WTO) but has an observer status. When it comes to soil resources, RS has a globally above average ratio of agricultural soil per capita. That ratio is 0,83ha of agricultural land per capita, which is an obvious advantage compared to the global average of 0,19ha and 0,21 in the EU (World Bank 2021).

Type of agricultural area	Size (in hectares)
Arable land and gardens	582.270
Orchards	52.191
Vineyards	314
Meadows	183.815
Pastures	162.662
Ponds and reeds	562

Table 5: Size of agricultural lands in RS, by type (Ministry of Spatial Planning, Constructionand Ecology 2013)

Overall, agricultural land is on the decrease, and according to the Spatial Plan of RS until 2025 (Ministry of Spatial Planning, Construction and Ecology 2013), which was published in 2013, it stands at 981.815 hectares, or 40,57% of RS territory. More than half of agricultural land can be found on altitudes above 500 meters, and some 26,08% of it is considered between second and forth quality class(Лукић et al. 1997). However the estimates do vary, so while Lukić et al found 337.000ha, the land cadastre data shows almost double that, at 625.000ha.

This however is not surprising for those working in the area, as acquiring quality statistical data is a cross-cutting issue in Bosnia and Herzegovina.

RS has irrigation potential for some 158,000 ha of agricultural land. Currently, an estimation by the Ministry of Agriculture, Forestry and Water Management is that some 35,000 ha are provided with irrigation infrastructure.

Most of the best quality agricultural land is state-owned, as a consequence of the socialist period nationalization and other measures which took place. This land is nowadays rented or rented to the farmers, by the entity RS. The latest estimate show that there is around 85,000 hectare of state-owned agricultural land in RS (Ministry of Agriculture, Forestry and Water Management 2006).

When it comes to arable land and gardens, which amounts to some 548,869 ha, in 2018 close to 60% of it was sown (320,995 ha), while the rest remained uncultivated, and in the period between 2014-2018 the overall trend was a slight increase in cultivated land. Cereals take the lead with the largest amount sown 67%, with fodder plants and vegetables following with 20% each (RS Institute of Statistics 2019). An investment in a, currently missing Land Parcels Identification System (LPIS) would provide more clarity on the status via direct input from the farmers. Still, it is safe to state that there is no shortage of available land for a considerable growth of agriculture, without endangerment of forests and other natural ecosystems.

The overall status of agricultural land paints a landscape of bountiful unused soil, ready to accommodate new crops and agricultural activities. Furthermore, protecting these lands from the current trend of land use change and deterioration should be undertaken with utmost urgency. Hemp farming, if properly administered, due to hemp's characteristics (e.g. deep roots and independence from pesticides) can be used as a tool in improvement or at least sustainable use of these soils, thus turning the tide of destruction. This abundance of land is also a positive

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development in terms of prevention of degradation and conflicts with forest and other ecosystems, such as those occurring in the case of cannabis in the USA (Klassen et al. 2019).

Most farms heavily rely on workforce within the household; however they are dependent on additional labor during seasons when activities intensify(Ćehajić et al. 2019). However, lack of said labor is one of the major problems in agriculture, one that seems to be worsening. The cost of labor is increasing as well. However, in terms of agricultural machinery, farms in RS are relatively well-equipped, albeit the machinery tends to be obsolete, with only some 11% of farms having tractors less than 10 years old. However, the survey found that only 18,5% of farmers did not have at least one tractor, and an average number of attachments was 3,5. As far as storage areas are considered, the age and quality issue transfer to this sector as well, with old and poorly equipped facilities for the most part.

Since hemp cultivation and processing is very labor intensive, investments in machines or workforce are of absolute importance. Due to a negative trend when it comes to population numbers in BiH, especially in the village areas, it is very unlikely that sufficient labor would be obtainable. The lack of hands is already experienced in other fields of agriculture(Pucar 2019). Therefore, if the hemp sector is to develop, considerable investments in machinery are necessary. The sources could come from:

- Farmers
- Interested businesses
- State support and fund
- Commercial credit lines
- Development agencies
- International organizations
- EU pre-accession funds

There are 382 agricultural cooperatives in RS. However, not all of them are active, for example out of that number 61 are categorized as passive, 181 do not undertake business/market activities and 34 are undergoing liquidation or bankruptcy, while 83 are active businesses(Government of RS 2021). The 83 active cooperatives gather 1,396 members. Next to the small number of members, cooperatives are primarily focused on ensuring supply of their members with raw materials than with the purchase and sale of produce.

RS is also home to 7.369 NGOs, with 70 agricultural organizations, 63 on municipal and the rest on RS level. This type of organizing can also be beneficial for organizing farmers and processors in agriculture, be it for marketing purposes, policy influencing, capacity development and other. However, the large number of organizations also poses the question if such a number is really necessary, especially if they do not cooperate between each other, further splitting and alienating their members from farmers and processors belonging in other organizations.

The example of Serbia and France shows the benefits of cooperative approach, and there are vast opportunities to explore in RS as well, especially in regions where large agricultural areas are relatively close to each other, decreasing transportation costs and simplifying logistics altogether. Cooperative approach can, as shown in the case studies as well as literature(Candemir et al. 2021), help with capital expenses, de-risking of activities and investments, simplification of procedures, aid in knowledge building and transfer, as well as, and at least as equally important - organize producers in order to advocate and lobby positive policy changes in an organized, efficient and effective manner.

A unification of efforts is especially importance when the current status is observed. According to the Agriculture and Rural Area Development strategy, there is a lack of adequate cooperation between the processing industry and farmers which results in a lack of wellorganized value chains. This, coupled with a negative ratio of export of primary products vs importing of final products leaves the sector in an unfavorable position. The document continues to make the claim that among key causes for this, at least judging by those on the processing side of the business, are the lack of high-quality input, insufficient amounts and lack of reliability in doing business. However, while both sides might have their grievances, the fact uniting both is that the outcome is equally detrimental for both sides.

RS also has a solid scientific infrastructure when it comes to agriculture, albeit investments in education and science are low(Kovačević et al. 2017). Next to two Faculties of Agriculture, RS has three independent research institutes: "Dr Vaso Butozan", veterinary institute; Agricultural Institute of RS; Institute of Genetic Resources.

Funding is procured via regular grants from the Ministry for Scientific-Technological Development, Higher Education and Information Society of RS as well as, albeit in a smaller amount, from other ministries of RS as well as BiH. Another major source of funding are international organizations as well as EU pre-accession funds.

Joining forces with scientific institutes and workers could be among key activities of hemp pioneers. The benefits do not stop only on the knowledge gained, but also spread to unlocking of new sources of funding, dissemination of information among new groups of stakeholders thus increasing hemp's visibility, gaining reputation points and additional weight of arguments thus aiding the improvement of hemp's perception in the eye of the public as well as policymakers. The outcomes could also be pointed towards development of new seed variants, processing methodology and equipment.

All competences regarding foreign trade policies, including protection measures related to importing of subsidized goods and other downsides small countries can face due to free-trade agreements, are in the jurisdiction of the BiH-level authorities. RS-level ministries can still create and suggest initiatives related to domestic production. On a state level, in the period between 2014-2018, Bosnia and Herzegovina imported between BAM 2,7 and 3,1 billion, but

exported only between BAM 662 million and BAM 1,1 billion of agroindustrial products. About ¹/₃ of imports and slightly more than ¹/₄ of exports are attributed to RS. Close to ¹/₄ of agroindustrial exports from RS is made of fruit and cereal products. Other than plant-based products, RS's significant exports are milk and dairy products. Meat and other animal products made for some 23% of overal export in the 2014-2018 period (Government of RS 2021). Import is dominated by cereals and food industry leftovers and animal feed, as well as meat products.

Overall, despite a large disparity between the considerable larged import and export, both categories have grown over time and as agroindustrial products make a significant portion of exported goods, it can be said that the agricultural sector is very open. This point needs to be stressed when discussing any potential hemp development, together with the fact that there is a negative trend where exports mostly consist of raw materials and less-developed goods, while import is mostly based on already processed or completed products.

As far as subsidies are concerned, in official statistics they are categorized by the Agri Policy Measures (APM) methodology in three major groups:

- Market support measures and direct support to producers
- Structural and rural development policy measures
- Public service support measures in agriculture

The way budget is structured, planned and allocated indicates that RS agrarian policy has been significantly production-oriented, as opposed to development-oriented. In the period of 2014-2018, the average share of budget allocations for the first pillar equaled to 79% of the sum, while the second and third received only 8% and 13% of the realized funds (Government of RS 2021).The environmental practices receive an especially low amount of support, so the average yearly amount was around BAM 0,11 million (around EUR 56,500.00).

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When compared to the value of agricultural production, the budgetary means dedicated to agricultural subsidies is around five times lower than that of the EU, when measured by support per hectare, the number is closer to 7 (Government of RS 2021).

In the aspect of support for structural adaptations and support for rural development, RS also been lagging compared to its neighbors, not only the EU. In the 2014-2018, North Macedonia increased its spending by 24%, while Serbia's investment increased by a whopping 300%.

Overall, support through public budget in RS are among the smallest in the region, and amount to about 5% of the value of agricultural production (data for 2017), or EUR 62 per hectare of used land. RS did have the largest funds in the region allocated to measures of market support and direct aid for producers.

This support structure is not in line with the approach taken through the CAP, and as an EU hopeful, RS is bound to have to change its approach as a part of EU accession-related activities. At the same time, such a restructuring is necessary if the negative trends are to change.

4.9 Status and outlook of hemp in RS

Growing hemp in RS is legal, much like in other countries - only under certain conditions. A permit can be obtained by persons and businesses, in line with the relevant rulebook. The main documents dictating hemp growing in BiH are the Rulebook on conditions for industrial hemp cultivation⁶ and the Law on production and trafficking of narcotics⁷.

The law makes a difference between marijuana and hemp, and defines, in article 14 that: "Hemp can be cultivated only with a prior procured permit from the Minister in charge of agronomy". The article further goes on directing those interested to the Rulebook, published by the Minister, as well as obliging them to report their undertakings to the Inspectorate as well.

⁶" Pravilnik o uslovima za uzgoj industrijske konoplje", Official gazette of RS, number 02/21

⁷ "Zakon o proizvodnji i prometu opojnih droga", Official gazette of RS, number 29/04

The major proposition of the rulebook is the one in relations to the definition of hemp, in relation to its THC content: "Article 2: Industrial hemp is hemp (Cannabis sativa L.) with THC concentration not larger than 0,2%, coming from a variety which is introduced in the Varietal list, in line with the rules on agricultural plant seeds".

An advantage that RS has over Serbia is the longer list of varieties of hemp allowed for cultivation. Those with the import permits can import the following varieties, in the same procedure like other seeds, and cultivated:

- Diana
- Fleischman
- Helena
- Kompolti
- Kompolti hybrid T.C.
- Kompolti Sarga Szaru
- Marina
- Novosadska konoplja (Novi Sad Hemp)

However, the lower level of THC does discriminate against inclusion of varieties with larger levels of THC which could, as mentioned in other chapters, pose numerous qualities important for a more bountiful as well as higher-quality yield. While the EU raised the allowed THC content to 0,3%, RS remains at 0,2% limit. As BiH undergoes the approximation procedure on its path to EU membership, the increase to 0,3% in RS might be easier to attain via transposition than through lobbying from the local angle only. The neighboring countries have similar legislation in this aspect, with the exception of North Macedonia, where growing of hemp for medicinal purposes is legal as well.

Article 3 defines the minimum area necessary for receiving of cultivation permit and puts it at one hectare. This is stricter than compared to Serbia where 0,5 ha is the norm. While this might not be a major obstacle for those determined to grow and sell hemp, it could make the decision harder for those who want to experiment on a smaller area, before going all in. Therefore, a change to 0,5 ha is a simple measure which might contribute to promotion of hemp development in RS.

Another space for improvement is the time limit of the cultivation permit, which is currently set at one harvest/season. As mentioned in the USA example, extension of permits to several years would decrease the amount of paperwork. This would on one hand decrease the amount of paperwork and expenses for the farmers, thus making the whole undertaking more attractive, and on the other, decrease the workload of bureaucrats across institutions, thus increasing their responsiveness and the amount of permits they can process.

Otherwise, the rulebook and law holds instructions and obligations which are standard for those working with other crops.

Much like in other countries, in order to receive the permit a set of documentation needs to be delivered, and next to documents related to land plots and company registration, documents testifying that the relevant persons have not been in any drug-related offenses are necessary.

Following the receipt of the needed permits, those dealing with hemp still need to fulfill several procedures:

- Safeguard the receipt from seed purchase
- Obtain and safeguard the health status certificate for the seeds
- Safeguard the declaration on seed quality with clearly visible information on the supplier, importer, amounts and type of seed purchased
- The original packaging in which the seeds arrived
- The label from the packaging

The above-described documents and materials need to be safeguarded for a minimum of two seasons.

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Following sowing, those in charge of the operation need to report, no later than 15 days after the act, the amount of land which was sown. The report is submitted to the Ministry of Agriculture, Forestry and Water Management, Republic Administration for Inspection Activities and the Ministry of Internal Affairs. Additionally, if any circumstances which point to misuse of hte plant should arise, the person/company in charge of the crop is obliged to report it.

The inspections are done by the Republic Administration for Inspection Activities, while the THC testing is done in a laboratory under the auspices of the Ministry of Internal Affairs.

Finally, among the documentation, the original contract for sales of the produced crop (the entire amount) needs to be delivered as well. It is unclear if this proposition is valid in cases where the farmer would also be the processor of the product (partially or until the final product).

In any scenario, this is yet another potential deterrent for which a detailed analysis of justification is necessary. In case of Serbia, the "Konoplja" cooperative managed to ease this obstacle by signing contracts with the farmers, which could be classified as "semi-binding".

For the 2021 season, the Ministry of Agriculture, Forestry and Water Management of RS received 10 requests for hemp farming, and green-lighted five of them. The deadline for applications, as defined by the rulebook is on March 31st (Urednik 2022). Year 2020 had 12 permits handed out, yet no recipients ended up planting actually planting hemp (Odobrenja Data, Ali Nema Usjeva: Da Li Je Konoplja Prilika Za Ozbiljan Biznis u RS? 2022). One of the producers stated in an interview that it was the legal ambiguities that caused his retreat. Other sources also stated the COVID19 pandemic as the cause, claiming it made obtaining seed material more difficult (Sladojević 2021).

According to an article which contained interviews with the persons involved, company *Bionatur Ekopro d.o.o.* had to leave an already signed contract with foreign investors since they could not import the needed seed material, despite there being a legal basis for it, according to the company representative (Katana 13:26:57Z). The import was attempted via a specialised company which deals with seed importing. After applying for the permits with the Ministry in RS and receiving them, and despite the fact that, the application was for importing of Helena seed, which is on the list of allowed variants, BiH Authority for plant health protection denied the import permit with the explanation that the material in question is a substance with psychoactive properties. Unfortunately, not much other information was found in relation to this incident, and since the article where this event was found provided the evidence (the Permit provided by the RS Ministry), there are no reasons to doubt its occurrence, and seemingly the issue pertained since the company founders decided to move their operation to Serbia, where he went into business with a hemp producer who is planting hemp on close to 200 hectares.

The aforementioned ambiguity concerns primarily CBD production, which is not possible in RS, since growing hemp is only legal for the use of stalk (fibers) and seeds (food, animal feed, seed production), and not flowers of leaves. As previously described, this is a major stepstone influencing the financial side of farmer's motivation. This rule makes even less sense, since CBD products can be imported in RS, and are already easily available on the shelfs of stores in RS.

Another potential loophole which could be researched is in the Article 16 of the Law on production and trafficking of narcotics, where it stipulates that "Institutions which undertake scientific and research work may, for scientific purposes, cultivate plants from which narcotics can be produced, if they obtain the approval of the relevant Minister". It is not known at this point if the research can be similar to the "market research" undertaken in the USA. In case this assumption is correct, theoretically hemp with higher THC and CBD content could be produced as well as marketed in economies which allow for its distribution. Unfortunately, during the

time of writing this hypothesis could not be validated or refuted by the relevant authorities, and it will have to wait for further research to be undertaken.

5 Conclusion and recommendations

Coming back to the main driving question of this thesis: "What is the status and future outlook of industrial hemp production in RS", it is clear that several recuring trends have been spotted in different parts of the world. The return of hemp is affected by several drivers as well as steppingstones from across different sectors: policy, economy, rule of law, human health promotion and protection, environmental restoration. These connections are not only multifold, but multi-directional and interwoven. These connections were well depicted by Young, using a casual loop diagram.



Figure 13: Factors and actors affecting the hemp industry, a casual loop diagram (Young 2005)

While there are several optimistic scenarios regarding the economic outlook of hemp, any definite claims require a detailed economic analysis. In the case of RS, the following factors need to be taken into consideration:

How large will both the domestic, but similarly, if not more importantly, the surrounding markets be, especially the EU? Will the RS products be competitive, and if so, under which circumstances?

How will the first undertakings be funded? A key importance in this aspect is that the financial feasibility increases with product processing on site or within near vicinity.

The French and Irish case studies have shown clear advantages in a cooperative approach, especially when it comes to de-risking and strengthening immature supply chains whose primary producers are yet to prove their worth and reliability on the markets. The cooperatives also serve as a collective brain and storage of best practices which can be disseminated among members and future farmers and updated with time. This role should also be crucial in advising new farmers in order to avoid the disillusionment, which is caused by overstated profits, which has been seen across the case studies presented in this paper.

The lack of labor needs to be taken into consideration if an increase in size of operations is to take place. Chances are that it would have to be substituted by specialized machines which will increase the capital expenses. This is yet one more field in which a cooperative approach should be utilized to de-risk investments and decrease the overall costs.

The cooperative approach, as well as building of alliances beyond the direct beneficiaries of hemp, might also prove itself instrumental for overcoming the legislative challenges. The primary goal for those efforts should be the "whole plant" approach, where all parts of the plant could be reaped, processed, sold, and used without any legal obstacles. This way next to being able to utilize the currently well-paying CBD crops, in the future the farmers will have more flexibility in deciding which type of hemp to use and which markets to aim, e.g. fiber (stalk), food (seed), medicinal and supplement (flower), etc, by analysing market trends and prognosis before the planting season. This flexibility can further be enhanced by introduction of long-term permits, e.g. five year permits. The multiple-season permits would decrease the workload for both hemp growers and the bureaucracy personnel, while the inspection services would continue their oversight activities as before. However, as for now a strict oversight of planned farming areas is needed, a specialized internet platform, or section

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in existing registries, is a possible solution to meet both side's needs halfway. After gaining the primary, multi-annual permit, the farmer would still need to register for every year of planting, but via a simplified procedure and the online platform, e.g. only inputing the data on type and amount of seed as well as the amount of land worked. These information should be sufficient for the inspection service to do their field inspections and screen the situation on the ground in line with the primary permit and the subsequent short-procedure applications. Additionally, a decrease to 0,5ha of minimum farming land for hemp permits should be introduced, as was in Serbia, in order to incentivize farmers interesting in testing the crops and gaining expertise before deciding whether to employ a full-scale farming operation of hemp.

CBD and THC content in hemp related legislation should follow the trends in EU, especially its more liberal members. The debate needs to be fueled primarily by research, both related to the possibility of inebriating effects of THC but also to the healing properties of CBD and the possible risks and dosage issues.

The pro-hemp alliances also need to take it upon themselves to introduce and educate the general populous, thus removing taboos, together with the relevant governmental bodies. Inclusion of scientific communities could create significant added value, from creating possibilities of new sources of funding to development of new strains as well as farming and processing technology as well as procedures, to increase yields as well as profits. A crosssectoral alliance building can also be instrumental in familiarization of the stakeholders and of the general public with the plant, and its distancing from marijuana and the negative image it transposes to hemp.

Bosnia and Herzegovina's EU accession should also be used to leverage the position of hemp and hemp farmers. The EU stakeholders are active and successful in lobbying for better conditions for hemp farming and since alignment with EU policy is key for accession, making alliances with EU stakeholders and utilizing the accession as argumentation during advocacy activities in BiH is the only logical course of action. Additionally, EU Instrument for Pre-Accession Assistance funds should be screened for hemp-related opportunities and lobbying in Brussel for their increase should also be considered.

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