HEMP - PECULIARITIES, VARIETIES AND REPRESENTATIVENESS

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Abstract: *Hemp is not a crop prohibited or restricted by law, a spring crop with tradition in Romania, even if the surfaces are in a decrease in last years. Hemp is and will be a motivating force for sustainable agriculture around the world. Summarizing the advantages of the "hemp" product we can mention: products obtained are used in various industries: textiles, pharmaceuticals, cosmetics, automobiles, it results in a high production per hectare, etc.*

Key words*: hemp, representativeness, varieties*

INTRODUCTION

Hemp is a spring crop with tradition in Romania, but in recent years the areas have decreased drastically. Since 2015, a coupled production support subsidy has been introduced to encourage farmers to invest in hemp. The new money from APIA joined the Transitional National Aid for hemp and "basic" subsidies for agricultural areas [8].

Figure 1. Hemp - aspects of representativeness

What we call hemp seed [berries] are actually fruits, we must also distinguish between hemp seed as a biological propagating material and the harvest of [berries] as an industrial material. Hemp cultivation for seed production is required to meet the demand in the technical field, food, cosmetics, fodder. Hemp seeds contain about 30% oil, 80% of which consists of unsaturated essential fatty acids that are not synthesized by the human body and 31% easily digestible proteins that can supplement or replace other sources of protein [10].

Romania was at the top of the world rankings in the '80s, when it invested heavily in the local hemp industry: the third world producer after the CIS and China, the largest processing plant from Europe-Sanniculau Mare and the development of one of the most competitive varieties of hemp in the world-Lovrin 110. In '89, hemp is cultivated on an area of 55,000 ha and a production of almost 30,000 tons, which today would generate revenues of billions of euros through the processing chain. In just 30 years, the entire infrastructure has become deficient, and today, hemp cultivation is on the verge of legality, due to very restrictive legislation.

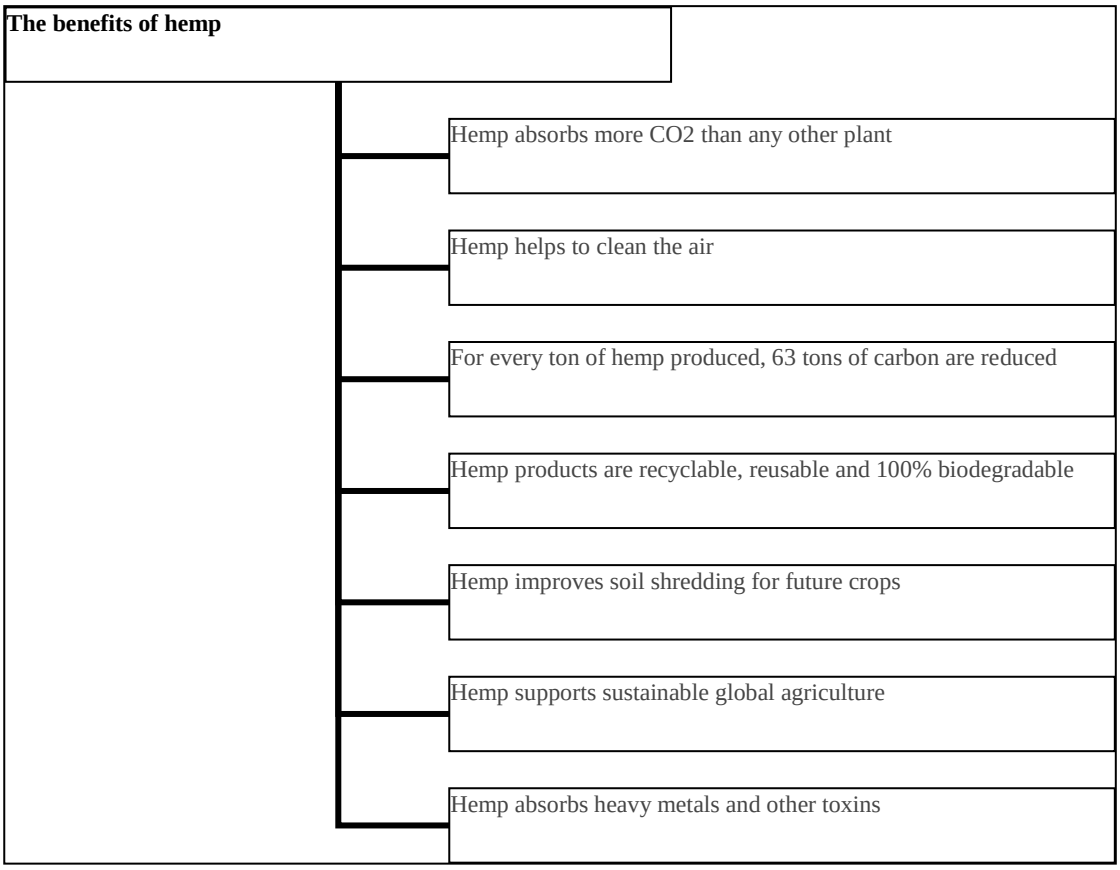

Figure 2. Hemp – benefits

The environmental benefits (Figure 2) of hemp are innumerable. Gaining plant growth contributes to reducing our ecological footprint, improving soil health for future crops and cleaning the air by removing CO2, while hemp products can also be recycled and 100% biodegradable. Hemp is and will be a motivating force for sustainable agriculture around the world. In many countries, there are widespread agricultural and environmental problems [1, 4, 5, 6, 7]. For example, monocultures-the practice of growing a single crop - have negative effects on biodiversity and soil quality. This type of agriculture often causes nutrient deficiencies for plants, causing many problems. Hemp can minimize these problems by acting as an intermediate crop. Countries such as Australia and France reward farmers with CO2 certificates for growing hemp, which is a testament to official government bodies that recognize the environmental benefits of hemp. These incentives also have a financial benefit for farmers. One benefit of hemp is that it can be grown in different climatic zones and soils, which means that it is easy to grow in remote areas that have fewer agricultural resources.

MATERIALS AND METHODS

In order to fulfill the purpose of this paper we used a multi-criteria analysis, using many types of materials: some databases from the field, some statistics, and many theoretic studies.

RESEARCH RESULTS

Hemp is not a crop prohibited or restricted by law, only that such a plantation must be authorized and monitored by the Ministry of Health and Family, the Ministry of Interior and the Ministry of Agriculture, Food and Forestry. Beyond the impediment to authorization and monitoring, hemp cultivation brings more than profitable gains to those

who invest in it. It is grown for its relatively high natural fiber content and for its seeds rich in drying oil. Hemp fibers are longer than flax, very durable and quite resistant. They are used to make a wide range of rot-resistant textiles, even in water. Short fibers (tows) are used in the manufacture of mattresses as well as an insulating material.

Secondary products-oils, cakes, puddings, are generally used as flax and ash obtained by burning wood is used as an organic fertilizer rich in phosphorus and potassium. Drugs with sedative, diuretic, vomiting, deworming and others are prepared from the tips of the inflorescences of female plants and from seeds.

On the other hand, hemp oil resulting from cold pressing of seeds is used as a natural supplement to fight cancer, diabetes or arthritis.

Due to the fact that it has so many uses ranging from the cosmetics or textiles industry to construction, hemp has gained a special interest lately for Romanian farmers, who have started to be interested again in the cultivation of this plant. Proof that there is demand is the fact that several processing plants have opened recently [9].

In recent years, this valuable crop has experienced a substantial decline that has been caused by:

- harvesting hemp with a high consumption of labor per hectare.
- the costs of setting up, maintaining and harvesting hemp were not covered by the income obtained from the capitalization of production, which made this crop unprofitable for many growers.
- being considered a drug, the cultivators were subjected to bureaucratic actions, which discouraged them from cultivating it.
- orientation of growers towards other more profitable crops with a higher degree of mechanization such as: sunflower, rapeseed and others.

The good news is that in recent years the state has set out to support the development of this sector occupied by hemp cultivation through substantial subsidies, which will attract as many growers as possible.

The seed intended for sowing must be of approved, certified varieties, having a purity and germination according to the analysis report and a maximum permissible humidity of 10%. Ripe hemp seeds have a characteristic luster, they are mosaic or not, having a variable color from light gray to dark brown, depending on the cultivated variety [10]:

Denise - mixed monoecious variety, fibers and seed, approved in 1999, obtained by hybridization, backcrossing and repeated selections following a high production of stems but also of seed, constituting a mixed variety of cultivation, is more resistant to low spring temperatures allowing early sowing. It blooms 4-5 days earlier than Secuieni 1, in the first phase the female flowers open, the interval of flowering and formation of inflorescences takes place over a period of 20-25 days. In the culture for the stems it has a vegetation period of 120-130 days and of 140-150 days in the one for seed. The average crop of stems can be between 8.2-10.5 t/ha depending on the applied agro found and the thermal and pluviometric regime. The seed harvest reaches 1200 kg/ha, and the fiber content of 29-30% determines a production of 2900-3200 kg/ha of technical fibers.

Zenith - obtained by hybridization and selection from a Secuieni monoecious line and a local population of De Aries. It is a monoecious variety with the lowest THC content upon approval. The size of the plants is very small and the vegetation period is 110-120 days. It is a specific variety for seed, 1100-1500 kg/ha, but an acceptable fiber production can be achieved (28% content in technical fibers and a production of 7.8-8.5 t/ha strains). By varying the sowing season until June 15, the plant height can be reduced to 1.2-1.5 m, the crop thus becoming suitable for mechanized harvesting with the grain combine directly from the field. Diana variety obtained by selection and repeated crosses between

Hungarian dioecious varieties of high production in stems and fibers, but late and with coarse fiber and monoecious selections from the genetic resources of the laboratory. In the new variety the productivity characters of the dioecious varieties and the quality ones of the monoecious varieties met, obtaining a variety for the production of stems and fibers of very valuable value, with a content of over 32%, quality fibers, at a production of stems of 11-12 t/ha. However, the seed production is much lower than in the Denise and Zenit varieties, being between 800-1000 kg/ha. Further research has focused on the development and diversification of genetic resources for use in the breeding process, corresponding to the characteristics acquired for the diversification of forms, oil content, and seed production.

Dacia-Secuieni, a variety of monoecious hemp approved in 2011 for stems and fibers. It was made by selecting the component line AR-1 of the Diana variety brought to the maximum production capacity following genetic and biological degradation by uncontrolled multiplication in the seed production process and the dioic line K-7. The maximum production is 11-12 t/ha stems, with a content of over 31% of good quality fibers which places this variety among the most valuable that will be expanded in production at the request of growers. A sufficient amount of seed will also be stored, available at any time for the resumption of fiber hemp in culture.

Secuieni - Jubilee - monoecious variety, approved for seed and oil production, 33.8% content, as well as its quality. It is a very early variety; the maturation of the seed takes place at the beginning of August, 15-20 days earlier than the Zenit variety. The production of stems and fibers is close to the Zenit variety, being an ultra-early derivation of its component families. Being an early variety, the size of the stems is much reduced to 1.5-2 m. Sown at a rate of 10 kg/ha, at a distance between rows of 50 cm, it can be harvested directly from the field with the grain combine with the high ivy. It is also suitable for cutting the tops once, or twice, but the sowing rate is reduced to 5 kg/ha in which case it reaches maturity by about two weeks. The reduced vegetation period determined us to study for successive cultivation after barley, wheat, rapeseed, the preliminary results confirm this fact.

In the southern areas as well as in the Western Plain, Banat, by successive cultivation, yields of up to 1000 kg/ha could be obtained, the essential condition is to ensure the humidity until sunrise. A special problem in maintaining monoecious varieties is their genetic and biological degradation in the process of repeated seed multiplication. In addition to the fact that the varieties can return to dioicity by losing monoicity in 1 -2 years, if the seed production process is not correctly applied and does not meet the conditions of the Seed Production Law, it is genetically degraded by repeated multiplication. The plants in the field suffer a strong masculinization to the detriment of the female inflorescences, consequently the gradual reduction of the harvest until the economic inefficiency of the culture. The process can be stopped by resuming the selection of the component lines of the variety, or eliminating some intermediate links in the process of seed multiplication. Another way to increase seed production to over 1500-2000 kg/ha would be to use unisexual female hybrids (B1, B2) which with a little effort from the research unit could obtain a yield increase of 30-50%, economically justified [11].

Table 1.

Data on the evolution of areas and production in Romania

The year	Area thousand ha	Total production thousand t
2013	0.1	**...**
2014	0.4	2.3
2015	0.4	1.9
2016	0.7	3.7
2017	1.7	2.6
2018	1.4	2.8
2019	1.4	3.1

Source: Date INS-2013-2018-Anuarul Statistic al României, 2019 - Date INS- Tempo online

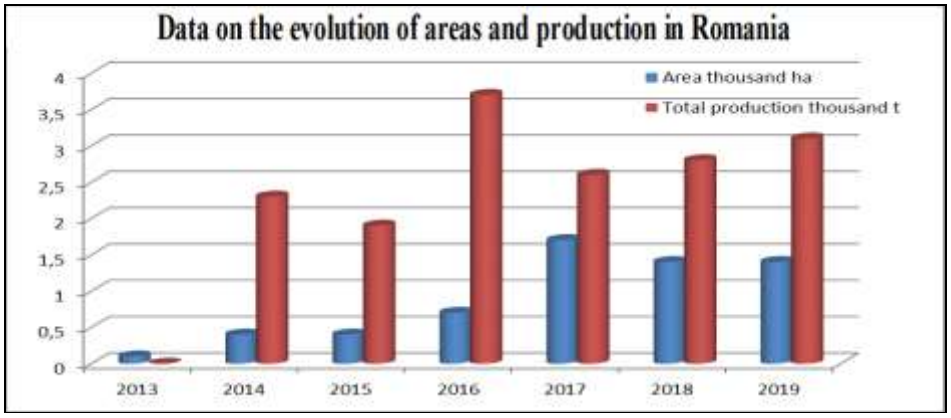

Figure 3. Data on the evolution of areas and production in Romania

According to the substantiation note, Romania has notified the European Commission to benefit from support schemes coupled to hemp for oil and fiber, for the period 2015-2020 by using the funds allocated on these measures, depending by surface and production (Table 1 and Figure 3). Thus, legislative changes need to be made quickly. They must also meet the deadline for the submission of payment claims [12]. The APIA subsidy that farmers who grow industrial hemp receive is based on the important schemes that are paid for all arable land in Romania. Hemp receives the single area payment - SAPS, the redistributive payment, the greening payment and the payment for young farmers [13].

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a) single area payment scheme;
b) redistributive payment;
c) payment for agricultural practices beneficial for climate and environment;
d) payment for young farmers;
e) coupled support scheme;
f) simplified scheme for small farmers.
g) Transitional national aid 1 (ANT1);
h) Transitional national aid 3 (ANT 3);
i) State aid for diesel fuel used in agriculture.

Table2.

Coupled support for hemp

The year	Proposal euro/ha	SAPS + invert euro/ha	TNA euro/ha	Total support euro/ha
2015	194	123	19	336
2016	204	136	17	357
2017	214	139	16	369
2018	224	141	15	380
2019	234	143	13	390
2020	240	143	13	396

Source: https://agrointel.ro/100605/cultura-de-canepa-subventie-hectar-apia/

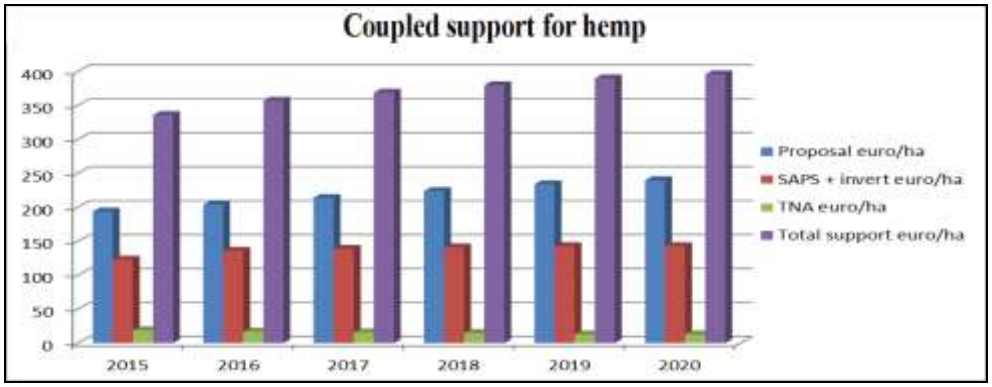

Figure 4. Coupled support for hemp

The coupled support you have introduced this year for certain crops could help revive hemp crops in Romania. Thus, the support coupled to hemp will be 194 euro / ha in 2015, and will increase by 10 euro each year, until 2020 (Table 2 and Figure 4).

The lack of a differentiated subsidy, but also the fact that it is somewhat more demanding crop, led to the restriction of the cultivated area in Romania. We appreciate that the Romanians gave up cultivating this technical plant primarily due to the fact that we do not have much where to process what we get in the field. Another reason why the cultivation of hemp was abandoned was that in our country the subsidy granted is much lower than in the EU and is not differentiated. In our country, flax and hemp are put in the same pot as sunflower and rapeseed.

Last year, only 10 farmers managed to receive subsidies for fiber and oil hemp, for an area of 519 ha, with a ceiling of 162,500 euros. For greater support, the conditions for eligibility for grants need to be reviewed. Keep in mind that wood produced per hectare of hemp can successfully replace the traditional wood, and coupled support should also provide financial support, considering hemp an organic plant that also produces a significant amount of wood per hectare [14].

Summarizing the advantages of the "hemp" product we can mention Figure 5 [15].

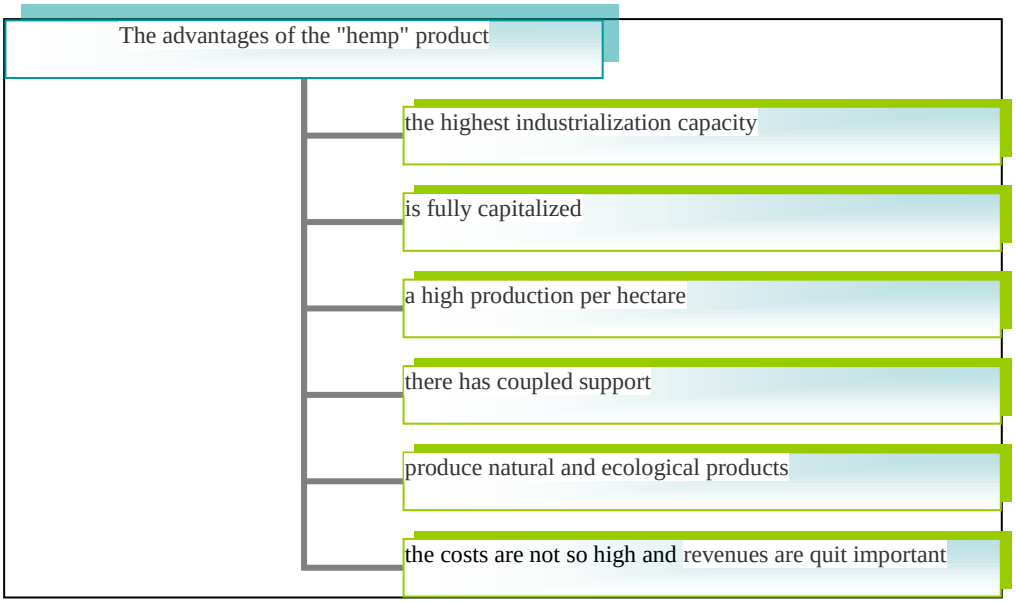

Figure 5. The advantages of the "hemp" product

1. Hemp has the highest industrialization capacity of all technical plants;

2. Everything from hemp is capitalized and the products obtained are used in various industries: textiles, pharmaceuticals, cosmetics, automobiles, etc.;

3. It results in a high production per hectare - hemp produces 250% more fiber than cotton;

4. There is coupled support this year. The coupled support introduced this year for certain crops could help revive hemp crops in Romania. Thus, the support coupled to hemp will be 194 euro/ha in 2015, and will increase by 10 euros each year, until 2020.

5. Hemp seeds produce beer, leaves make medicines and medicinal teas, fibers produce natural and ecological knitwear;

6. The costs for cultivating one hectare of fiber hemp amount to about 2000 lei and an average of eight tons of hemp stem can be obtained;

7. The revenues obtained from fiber hemp on one hectare of land amount to between 2,600 and 3,900 euros;

8. The production of hemp for seed costs 2500 lei/ha, and the harvest amounts, on average, to 700 kg/ha. The sale price is about 1000 euros/ton of seed;

9. Romanian hemp-appreciated for export;

10. The legislation is today conducive to hemp cultivation but hemp cultivation is allowed only on the basis of an authorization issued by the Ministry of Agriculture, Forests and Rural Development, through the county directorates for agriculture and rural development (DADR) [2, 3].

11. We had the largest processing plant in Europe-at Sanniculau Mare and developed one of the most competitive varieties of hemp in the world - Lovrin 110.

CONCLUSIONS

Until 1990, Romania was the third hemp-producing country in the world, with a cultivated area of approximately 49,000 hectares, but its inclusion on the list of narcotic plants limited to zero the interest of producers. Moreover, being a culture that requires a lot of physical work, many were discouraged from cultivating. In 2010, for example, only 23 hectares of land were cultivated with hemp, and in 2014 the cultivated area was over 765 hectares.

However, the plant is a future for Romanian farmers, with a high demand for exports. Productions per hectare are also important - up to 3,000 kg per hectare.

At the same time, hemp capitalizes on less productive soils and the crop can be extended over a large area in our country, because it meets favorable conditions up to altitudes of over 800 meters, which implies an economic advantage [12].

One of the areas known for this culture is Timis, where there used to be many growers. Now it seems that many have returned to hemp cultivation, after the unclear legislation of recent years made them give up this crop. If in 2012, there were only five hectares cultivated with hemp, now there are over 230. The price of a kilogram of hemp seeds varies between 30 and 60 lei, compared to wheat, which is under one leu. Very importantly, hemp is the only crop plant from which the seeds, stems and leaves can be used.

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