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SWOT Analysis for Hemp Farming in the Black Sea Region and Mechanization in Enterprises

Karadeniz Bölgesi Kenevir Tarımı İçin Swot Analizi ve İşletmelerde Mekanizasyon

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ÖZET

Tarımsal faaliyetlerde yeni üretim tekniklerinin kullanılması, teknolojik gelişmelerin uygulanabilmesi ve tarımda makina kullanımının artırılması ile mümkün olmaktadır. Kullanım alanları oldukça geniş olan kenevir bitkisinde mekanizasyonun geliştirilmesi tarımının yaygınlaşmasında en önemli aşama olmaktadır. Samsun ilinde kenevir üretiminin yaygınlaştırılması ile ilgili olarak yapılan çalışmada, işletmelerin mevcut durumunun belirlenmesi ve mekanizasyon kullanım potansiyelinin ortaya konulması amaçlanmıştır. Samsun ilinde var olan kenevir işletmelerinde mekanizasyon kullanım durumunun kenevir tarımı üzerine ne tür etkiler yarattığının ortaya konulması amacıyla SWOT analizi yapılmıştır. Araştırma; anket alanındaki işletmelerin; nüfus ve işgücü, eğitim durumu, arazi varlığı ve dağılımı, arazi kullanımı, tarımsal yapı ve üretimi, mekanizasyon düzeyi saptanmıştır. Çalışma, 2019-2020 yılları arasında yürütülmüştür. Samsun'da kenevir üretimi yapılan Vezirköprü, İlkadım, Ondokuzmayıs, Bafra, Alaçam ilçelerinde bulunan 50 adet kenevir üreticisi ile anket çalışmaları yapılmıştır. Yapılan çalışmada, üreticilerin mekanizasyon kullanımı ile ilgili olarak mevcut durumu SWOT analizi ile değerlendirilmiştir. Elde edilen anket çalışması sonucuna göre üreticilerin %72'sinin tohum amaçlı kenevir üretimi yaptığı, üretim tecrübesi yönünden incelendiğinde ise % 58 'inin 20 yıldan fazla kenevir tarımı tecrübesi olduğu tespit edilmiştir. Üreticilerimizin % 56'sının elle serpme işlemi ile ekim yaptığı, %44'ünün buğday ekimi yapan pnomatik ekim makinaları ile kenevir ekimini gerçekleştirdiği sonucu elde edilmiştir. Çiftçiler makina ile ekimde elle ekime göre %15-20 verim kaybı olduğunu belirtmişlerdir.

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ABSTRACT

The use of new production techniques in agricultural activities is possible with the application of technological developments and the increase in the use of machinery in agriculture. The development of mechanization in hemp, which has a wide range of usage areas, is the most important stage in the spread of its agriculture. In the study conducted on the spread of hemp production in Samsun province, the current status of the enterprises was determined and the potential for mechanization was revealed. SWOT analysis was conducted in order to reveal the effects of mechanization use in existing hemp enterprises in Samsun province on hemp agriculture. The research determined the population and labor force, education status, land assets and distribution, land use, agricultural structure and production, and mechanization level of the enterprises in the survey area. The study was conducted between 2019-2020. Survey studies were conducted with 50 hemp producers in the Vezirköprü, İlkadım, Ondokuzmayıs, Bafra, Alaçam districts where hemp production is carried out in Samsun. In the study, the current status of the producers regarding the use of mechanization was evaluated with SWOT analysis. According to the results of the survey, 72% of the producers produce hemp for seed purposes, and when examined in terms of production experience, it was determined that 58% of them have more than 20 years of hemp farming experience. It was concluded that 56% of our producers plant by hand-spreading, and 44% plant hemp with pneumatic planting machines that plant wheat. Farmers stated that there is a 15-20% loss of yield in planting with machines compared to planting by hand.

1. INTRODUCTION

Hemp (*Cannabis Sativa* L.), with 2n:20 chromosomes, is one of the first cultivated plants in human history grown for its long, strong fibers and seeds used especially in the textile industry. As a result of archaeological studies, remains of fabric produced from hemp dating back to 8000 BC have been found. Hemp, the first plant used in rope making on earth; originated from a wide area extending from the Caspian and Himalayas to China and Siberia. The plant, which was brought to Western Asia and Egypt 1000-2000 years ago and to Europe in 1500 BC by the Scythians; is known to have been found in Anatolia in 700-800 BC (Incekara, 1971; Atakişi, 1999).

Hemp (*Cannabis sativa* L.) *is* an annual plant species in the *Cannabi*s genus of *the Cannabaceae* family of *the Urticales* order. Cultivated industrial hemp is a subspecies (*C. sativa sp. vulgaris* L.) variety that can grow to 120-450 cm long (Aytaç et al., 2018; Fidan et al., 2023).

France produces 80% of the world's hemp seed. In 2017, China produced 28% of the world's hemp fiber, North Korea 25%, and the Netherlands 16%. Our hemp production has almost disappeared in recent years (Crini et al., 2020). Within the scope of studies to develop hemp production in Samsun, 15 tons of hemp seeds and 18 tons of hemp fiber were produced (TÜİK, 2019). Hemp production was regulated by Law No. 2313 on the Control of Narcotic Substances, enacted in 1933. The+/ regulation regarding the permitted cultivation of hemp was amended in 1990, and "hemp cultivation for fiber, seed, stalk, and similar purposes" was subject to the permission of the Ministry of Agriculture, Forestry and Rural Affairs (Pratiwi et al., 2023). The ministry was given the authority to "determine, declare, and control the production of hemp cultivation areas" (Ekiz et al., 1989). While the previous Regulation permitted hemp cultivation in 18 provinces, Şanlıurfa was removed from the list in the new regulation dated 29.09.2016. Karabük and Bartın, which became provinces after the division of Zonguldak Province, were added to the list, and the number of provinces where hemp production can be carried out, provided that a permit is obtained, has become 19. According to the legislation in our country, *Cannabis sativa* are evaluated according to the regulations regarding “Cannabis”.

The cannabis plant is an herbaceous plant that can branch more or less depending on the purpose of cultivation. It has a taproot system. The root system, which consists of the main taproot and secondary and lateral roots, can go down to a depth of 3-4 m depending on the soil conditions. In female cannabis, the stem is thicker and the fiber yield is higher, while in male cannabis, the stem is thinner, the fiber yield is lower but the fiber quality is higher. Each leaf on the plant consists of 7-11 leaflets with serrated edges. Cannabis is a dioecious plant. However, monoecious forms are also encountered. The cannabis fruit is a nut (achene). The seed inside the nut is endospermic and the embryo is curled inside the fruit. The seeds are hard and greenish in color. The plant grows better in soft and humid climates and is successful in weed control because it is a hoe plant. The hemp plant leaves a weed-free and tempered soil, so it is a good rotation plant for every plant (Atakişi, 1999; Ona et al., 2025). Hemp seed contains 30-32% oil, 22-23% protein, 30-35% carbohydrate, 1.5-2% sugar, and 5-6% ash, the remaining part of the burnt organic matter (Gizlenci et al., 2019).

In our country, the first step in soil preparation for summer hemp cultivation is to mix the stubble residues of the previous crop with the soil by deep plowing in the fall. In the spring, when the soil is ripe, light plowing is done with a plow at a lesser depth to eliminate weeds in the field. The clods that emerge are broken up by disc harrows and the soil is crushed. Then, plow or tap equipment is used to level the field.

When the soil is ready, planting should be done as soon as possible. Early planting can cause a positive increase in hemp yield. Planting is done by hand or machine. Manual planting is not suitable for reasons such as using too much seed, not falling to the same depth, not providing a homogeneous emergence, and difficult maintenance work. Pneumatic seeders that plant wheat are also suitable for hemp planting. When planting with a pneumatic seeder, the row spacings applied should be set as 20 cm for fiber and seed production. If production is made for fiber, the planting machine should be set so that there will be 160 plants per square meter, and if planting is planned for seeds, there will be 120 plants per square meter. 3.5-4 kg/da seed should be used for fiber production and 2.5-3 kg/da seed should be used for seed production (Gizlenci et al., 2019; Klevenhusen et al., 2024).

To be able to cultivate hemp economically, maintenance works such as hoeing and irrigation are needed in the early stages of plant development. The first hoeing process for weed control is done when the plants are 5-10 cm tall, and the second hoeing is done when they are 25-30 cm tall (Sorrentino et al., 2021). Irrigation should be done 2-4 times in arid regions with insufficient rainfall. Irrigation is carried out with flood irrigation in our country. Since hemp removes more nutrients from the soil, commercial fertilizer application, especially nitrogenous fertilizer, should be done to maintain soil fertility. Fertilization is done twice as base fertilizer and top fertilizer. In general, base fertilizer is applied with a ruffler, and top fertilizer is done by hand sprinkling. In hemp farming, it is recommended to mix barn manure into the soil in the fall and to support it with nitrogenous and phosphorous commercial fertilizers with planting in the spring (Wimbish et al., 2024). 2-4 tons of barn manure per decare is sufficient. 8-12 kg of pure commercial fertilizer per decade. Superphosphate fertilizer with nitrogen $(NH_4)_2SO_4$ or NH_4NO_3 and 6-8 kg/da phosphorus positively affects stem and fiber yield. (Gizlenci et al., 2019).

In our country, harvesting is carried out by removing the stalks by hand, as well as with the help of mowers. While one person can harvest 3 acres of land per day by hand, 20-25 acres can be harvested by machine. The mowed stalks are laid between the plant rows with the root parts on one side and the tip parts on the other. Uniform drying is achieved by turning them upside down every few days. To obtain fiber from the stalks, 10-15 stalks are bundled and brought to the pooling place. Since the female hemp is sufficiently dry in the field for seed maturation, the seed is harvested directly by passing it through the threshing machine. The obtained seeds are cleaned by passing through sieves, and the seeds with a maximum moisture of 8-10% are stored in sacks in warehouses until sale.

Hemp is a plant that is highly utilized per unit area. All plant parts are evaluated in different ways. The hemp plant is used in many different areas such as textile, automotive, furniture, nutrition, beverages, paper, construction materials, cosmetics, and medicine (Tutek and Masek, 2022). The fibers obtained from the stems of the plant, which contain high levels of cellulose, lignin, and hemicellulose, are the most utilized parts (Kim et al., 2021). Hemp fibers, known for their durability, have been used in the production of sacks, sails and tent fabrics, military equipment, fire hoses, ship ropes, and insulation of buildings, and it has been reported that their durability is 10 times greater than steel (Kara, 2013; Aytaç et al., 2018). Hemp, which is rich in cellulose, was used as a fiber source before synthetic fibers became widespread worldwide. However, due to the high labor force, it lost its competitive power against cotton and synthetic fibers and its cultivation area decreased in many countries (De Meijer, 1994; Shamim et al., 2024).

Hemp seed has recently been shown as a biodiesel source due to its 30-32% oil content. After the seed is processed, the remaining pulp is pressed and used as animal feed and protein-rich flour. The fiber residues remaining after the fibers are removed are also important (van Klinken et al., 2024).

Biodiesel does not contain petroleum; however, it can be used as a fuel either pure or mixed with petroleum-based diesel in any ratio. Pure biodiesel and diesel-biodiesel blends can be used in any diesel engine without any modifications or with minor changes. The distinctive features of the hemp biodiesel produced are low cloud point and low kinematic viscosity. Cold flow properties make hemp biodiesel attractive competitive and preferable (Li et al. 2010; McCormick et al., 2024).

There is a need for research studies on the use of mechanization in hemp and hemp farming in our country. This study we have conducted is original in terms of being a resource for the research studies to be conducted.

2. MATERIAL AND METHODS

This study was conducted between 2019-2020. The study was planned to survey 61 hemp producers in the districts of Vezirköprü, İlkadım, Ondokuzmayıs, Bafra, and Alaçam, but due to the legal responsibilities brought by the hemp plant causing concern in the producer and the destruction of the products of 4 producers, the surveys were completed with 50 producers. The questions asked to the producers in the survey, study were of a number and quality that would reveal the current status of the enterprises and producers and were prepared by taking the study of Karamürsel (2010), as an example. The survey questions are given in Table 1. In the surveys, the current status of the producers regarding the use of mechanization was revealed and evaluated with 30 questions.

Table 1. Survey questions regarding general characteristics of hemp producers and businesses

No	Mechanization Usage Status in Hemp Farms in Samsun Province		
1	Name and Surname of the Manufacturer	**16**	Hemp Seed Production Quantity (kg)
2	District Name	**17**	Status of Producers Benefiting from Agricultural Supports
3	Number of Household Members	**18**	Non-Farm Income Generation Status of Producers
4	How Many People in Your Household Are Engaged in Agriculture?	**19**	Marketing Situation of Manufacturers
5	Manufacturer's Age Range	**20**	Marketing Problems of Manufacturers
6	Educational Status	**21**	Hemp Seed Sources for Growers
7	Farming Experience	**22**	Tools and Equipment Used in Soil Preparation
8	Farmers' Hemp Farming Experience	**23**	Usage of Mechanization in Planting
9	Their Commitment to Sustaining Hemp Cultivation	**24**	Mechanization Usage Status After Seed Planting
10	Ability of Producers to Ensure Land Security	**25**	Irrigation Status
11	The Reason Why Manufacturers Produce Hemp	**26**	Hoeing Status

12	How Manufacturers Follow Developments on the Internet	**27**	Mechanization Usage Status in Base Fertilizer
13	Total Land Assets (decare)	**28**	Usage Status of Mechanization in Top Fertilizer
14	Hemp Production Area (decare)	**29**	Use of Mechanization in Harvesting
15	Purpose of Hemp Production	**30**	Usage of Mechanization in Seed Harvesting

In 2018, hemp production in Samsun was only in the Vezirköprü district and was carried out with 29 producers in an area of 113 decares. In 2019, the number of permitted hemp producers, districts, and areas increased. In total, 61 producers produced hemp in an area of 480 decares. By hemp legislation, the hemp gardens of 4 producers were destroyed.

SWOT Analysis is a method used to determine opportunities and threats originating from the external environment by revealing the strengths and weaknesses of the organization, technique, process, or situation examined (Sayın et al, 2010; Puyt et al., 2023). The SWOT analysis method was used in the evaluation of the thesis study. SWOT (GZFT) Analysis, which stands for 'S (Strengths): Strengths, W (Weaknesses): Weaknesses, O (Opportunities): Opportunities and T (Threats): Threats', is a method in which an organization is systematically examined in interaction with its environment. Using this method, the strengths and weaknesses of the sector and the region, and the situations that may be an opportunity and threat element regarding hemp production in Samsun province were analyzed. The distribution of the enterprises applied in the survey study by district is given in Table 2.

Table 2. Distribution of surveyed enterprises by district

District	Number of producers
Vezirköprü	46
Havza	2
İlkadım	1
Alaçam	1
Toplam	**50**

The survey results were grouped as the structural status of hemp enterprises and the use of tools and equipment in hemp farming, and the answers to the questions were calculated as percentage values. As a result of these calculations, the current status of hemp enterprises and the use of mechanization in hemp were revealed. Since the distributions of the data were mostly concentrated on certain topics, no statistical analysis was performed, only proportional values were given.

3. RESEARCH FINDINGS AND DISCUSSION

In the study, the current status of hemp enterprises and the use of mechanization in hemp were tried to be revealed in the survey. In the studies that have not been presented about hemp, research on different products was used.

3.1 Producer density and average age

When Samsun province is examined in terms of hemp enterprises, according to the survey results, 92% of the producers produce hemp in Vezirköprü district, while the remaining 8% produce in other districts. The majority of the producers in Vezirköprü (78%) are located in Narlısaray Village.

It is seen that the average age of the producers surveyed in the enterprises is mostly between 37-47 years old (38%). Sayar Yapar (2020) stated in his research that the average age of the business owners is 53. It was concluded that the producers who do hemp farming are younger than the producers who do buffalo farming. As a result of the survey conducted with producers, the density and average age of the enterprises by district are presented in Table 3.

Table 3. Distribution of surveyed enterprises according to producer density and average

	Producer density			**Average age**			
	Vezirköprü-Narlısaray	Vezirköprü Diğer	Diğer	25-36	37-47	48-58	59-69
Number of People	39	7	4	5	19	14	12
Percentage	%78	%14	%8	%10	%38	%28	%24

3.2. Education status of producers and number of household members in the enterprises surveyed

When the hemp producers who participated in the survey were examined in terms of educational background, it was seen that the majority of the producers (64%) were primary school graduates and 4% were university graduates (Figure 1). In the research conducted by Gökdoğan (2012), when the producers were evaluated in terms of educational background, it was determined that 50% of them were primary school graduates and 4% were university graduates. The study conducted is similar to our study in terms of educational background.

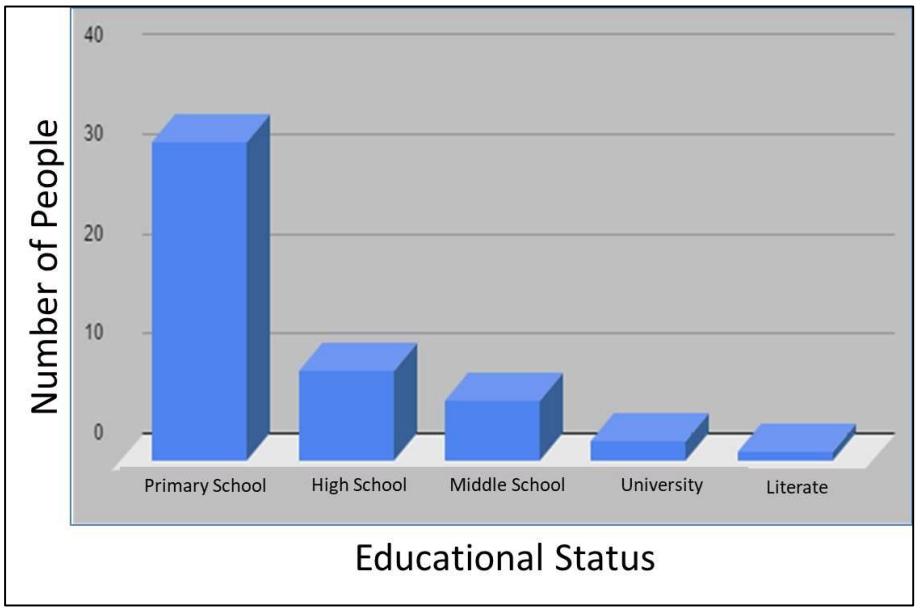

Figure 1. Educational status of the surveyed enterprises

According to the survey results, the majority of producers (48%) have a household number between 2-5, while 42% have a household number between 6-9 (Table 4). According to the values obtained from the survey, there is an average of 3 people per farm in businesses engaged in agriculture. These values reveal that the land assets allocated for hemp in the businesses in the survey area do not pose a problem in terms of labor. However, during certain periods, labor is needed, especially in jobs that require intensive labor, such as harvesting.

3.3 Examination of enterprises in terms of farming experience and hemp farming experience

It was concluded that the farmers participating in the survey had an average of 35 years of farming experience and had been involved in farming since childhood, and when hemp farmers were examined, it was seen that 18 people had more than 20 years of hemp farming experience. According to these results, 15 people had just started hemp farming, and it was concluded that the culture of hemp production in hemp enterprises had been going on for many years and 30% were new producers. In the research conducted by Gökdoğan (2012), it was seen that 49.10% of agricultural enterprises had been operating for more than 21 years. It is parallel to our study.

3.4 Examining the status of businesses following developments on the Internet

When the surveyed hemp producers were examined in terms of their internet usage, it was determined that 22% of the producers were following the developments on the internet, were open to innovations, and followed the changes, while 78% did not use the internet and produced hemp as they had seen from their family elders and without looking for anything different

3.5 Examination of hemp production areas of enterprises

When the hemp producers participating in the survey are examined in terms of hemp production areas, it is seen that 86% of the producers produce hemp in an area below 10 decares, and 10% produce hemp in an area above 20 decares (Figure 9).

Ayberk and Hurşitoğlu (2002) concluded in their study in Kayseri province that agricultural enterprises are generally small enterprises, our study similarly concluded that hemp production areas have an agricultural structure dominated by small family enterprises based on private property

3.6 Examining the amount of hemp seed production by enterprises

When the hemp producers who participated in the survey were examined in terms of hemp seed production amount, it was concluded that 84% of the producers produced less than 500 kg of hemp seeds and 18% produced more than 1000 kg of hemp seeds.

3.7 Examination of the hemp production purpose and marketing situations of the enterprises

It is seen that 72% (36 people) of the hemp production purpose produce hemp for seed purposes and 4% (2 people) produce seeds only for fiber purposes (Table 4).

The producer who produces seeds benefits from the fiber, even if it is of second quality. When hemp producers are examined in terms of hemp marketing problems, it is concluded that 60% of the producers (30 people) do not have problems with hemp marketing, while 40% (20 people) have problems with marketing. In particular, the producers stated that they could not find buyers for hemp stalks.

3.8. Examining the sources from which hemp producers obtain their seeds

When the hemp producers participating in the survey are examined in terms of hemp seed sources, it is seen that 76% of the producers use seeds they grow with their means, while 24% carry out production by purchasing seeds from outside.

Table 4. Hemp production purpose and marketing status of the surveyed enterprises

	Purpose of hemp production			**The state of hemp marketing**		
	Seed	Fiber	Seed Fiber	Broker	TİGEM	Broker TİGEM
Number of people	36	2	12	28	10	12
Percentage	%72	%4	%24	%56	%20	%24

3.9. Examining the non-agricultural income generation status of hemp producers

When the hemp producers who participated in the survey were examined in terms of whether they had any source of income other than hemp production, it was concluded that 66% of the producers earned income from hemp production and other herbal products, and 34% earned income from sources other than agriculture. 12 of the enterprises participating in the survey generate non-agricultural income. The results of this study are parallel to the results of our study.

3.10. Examination of the use of tools and equipment used by hemp producers in soil preparation

In the land where hemp is cultivated, the soil is brought to the pan and processed deeply using plows, harrows, and crowbars, and made ready for planting. 86% of the producers surveyed use plows, crowbars, and harrows. The remaining producers (14%) do not feel the need to use crowbars because they think that the field does not need to be processed deeply due to the soil structure.

It was emphasized that soil preparation for hemp cultivation should start in the autumn, first if there is stubble in the field, this stubble should be mixed with the soil, then deep plowing should be done with a plow in the autumn (Kim et al., 2020). In the spring, a good seed bed should be prepared by pulling a crowbar and a harrow to the field where hemp will be planted and the soil should be made ready for planting, and this was similar to our study (Incekara, 1971).

3.11 Examination of the use of mechanization by hemp producers during and after planting

In our country, planting is done by hand and machine. Manual planting is not suitable because of excessive seed use, seeds not falling to the same depth, not providing a uniform emergence, and difficult maintenance work (Incekara, 1971; Lanzanova et al., 2024). According to the survey study we conducted, 56% of our producers who grow hemp perform planting by hand planting. The remaining producers (44%) perform hemp planting with pneumatic seeders that plant wheat. After planting, 22% of the producers use rollers to increase the relationship of the seeds with the soil, to bring the water in the lower layers closer to the area where the seeds are located and thus to help germination, and 78% stated that they do not need it because the field surfaces are smooth.

3.12. Examining the irrigation and hoeing status of hemp producers

The hemp plant can be grown without irrigation in regions with annual rainfall of over 700 mm. In arid regions with rainfall below this amount, irrigation should be done 2-4 times. Hemp needs a lot of water, especially in the early development stages. Irrigation must be done during this period. If hemp cultivation is done for seed production, at least 4 irrigations should be done because irrigation done in

the advanced development stages of the plants delays maturation and therefore increases seed yield and quality (Incekara, 1971; Vijaya, 2021). 92% of the producers surveyed realized that excessive irrigation by flood irrigation would increase seed yield and quality.

In the hoeing processes applied to cannabis plants, 72% of the producers do hoeing by hand. The first hoeing is done when the plants are 5-10 cm tall, at a depth of 15-20 cm to control weeds and break the crust. The second hoeing is done when the plants are 30-40 cm tall. However, if the first hoeing is done well, they do not need the second hoeing.

3.13 Investigation of the use of mechanization in base fertilizer and top fertilizer by hemp producers

In the surveyed enterprises, 40% of those using mechanization in base fertilizer have applied fertilizer with a ruffler. The rest apply fertilizer by hand. Since hemp is tall in top fertilizer, it is difficult to use mechanization. 96% of the producers apply fertilizer by hand.

3.14 Examining the use of mechanization by hemp producers in harvesting and seed harvesting

Hemp harvest is done by hand or machine. In hand harvesting, the field must be watered beforehand and the soil must be brought into a pan. Otherwise, the stems will not be easily removed. Hand harvesting can also be done using sickles and scythes. Harvesting with machines is done with mowers or reapers. In the survey, it was observed that 90% of the enterprises harvest by hand. It was determined that producers harvest 98% of the seeds by hand-beating. 2% of the producers harvested with their own developed machines.

3.15. Samsun Province Hemp Agriculture SWOT Analysis

SWOT Analysis was conducted by interviewing the thesis director Derya Saltık İbiş, who works at the Samsun Provincial Directorate of Agriculture and Forestry, with registered hemp producers, a survey conducted during the thesis, the evaluation of the studies conducted by the Hemp Research Institute and the Black Sea Agricultural Research Institute, as well as secondary data obtained from national and international sources directly and indirectly related to previous studies and research

Strengths

- The ecology (climate and soil conditions) of the Samsun region is at an optimum level for the Hemp plant.
- High adaptability
- It is a good pre-crop plant that can be used in rotation with legumes and grasses. It has positive effects on the physical and chemical structure of the soil.
- It leaves a weed-free field for the crops that come after it.
- Diseases and pests are almost non-existent
- Hemp plants are used as raw materials in the production of biodiesel.
- Producers have a cannabis culture
- Most of the producers use their seeds

Weaknesses

- In recent years, the cultivation area of hemp has gradually decreased and it has come to the point of extinction.
- Official controls on hemp production put pressure on production
- Irregular seed pricing

- Inadequate agricultural policies to promote the cultivation of the hemp plant in the region
- Support policies fail to make the cultivation of hemp plants attractive,
- Lack of experienced technical personnel in solving difficulties encountered in production
- Due to the ineffectiveness of agricultural organizations and cooperatives in the region, producers are not directed to this area.
- Lack of registered seeds and inconsistent behavior of producers regarding seeds
- High technology costs
- Limited areas of use
- Starting to produce synthetic fibers as an alternative to hemp fiber
- In addition, the active ingredient of the female cannabis plant is '' *Cannabinol* '', which has a narcotic effect.
- Less use of mechanization
- The problem of marketing hemp stalks
- Fiber processing techniques have not yet been developed.

Opportunities

- The cannabis plant is classified as a strategic plant.
- The 'Hemp Research Institute' and the 'Black Sea Agricultural Research Institute', which research the hemp plant, are active in the region.
- The by-products can be used in animal husbandry in the region.
- The instability in agricultural products produced on a large scale in the region has led the farmers of the region to seek new solutions.
- Having a young, educated, dynamic, and innovative population,
- The flexibility and durability that comes with being a family business
- A certain breakthrough has been made in private sector-public-university cooperation.

Threats

- Economic difficulties
- Accelerating rural-urban migration
- Economic inadequacies in support policies

4. CONCLUSION

Although the level of agricultural mechanization in our country is above the world average, it is at a low level compared to developed countries and EU countries. The level of development in agriculture among countries means the same as the development of mechanization in agriculture. Hemp is distinguished from other plants due to its wide range of areas of use, and increasing the use of mechanization in such a plant will make a great contribution to the country's economy. In addition, strengthening the industrial side in the processing of hemp raw materials is as important as mechanization.

This study was conducted between 2019-2020. The thesis study was planned to survey 61 hemp producers in the districts of Vezirköprü, İlkadım, Ondokuzmayıs, Bafra, and Alaçam, but due to the legal responsibilities brought by the hemp plant, the anxiety it caused to the producer, and the destruction of the products of 4 producers, the surveys were completed with 50 producers. When the results obtained

from the surveys were examined under two main headings; In the first stage, the general situation of the enterprises was revealed. In the second stage, the use of mechanization in hemp farming was tried to be determined. The study was conducted between 2019-2020, and the questions asked to the producers in the survey study were made and evaluated with 30 questions in number and quality that would reveal the current situation of the enterprises and producers. During the data collection phase of the study, many difficulties were encountered due to working with the hemp plant. The producers did not want to conduct a survey. The stage of convincing the producers that the study would not pose a problem for them took a long time.

92% of hemp producers in Samsun province produce hemp in the Vezirköprü district, while the remaining 8% produce in other districts. 78% of the producers in Vezirköprü are located in Narlısaray Village. It was determined that the average age of 38% of the producers is between 37-47.

86% of the producers use plows, crowbars, and harrows, and the remaining producers (14%) find the use of ploughs and harrows sufficient. The producers who do not use crowbars reported that they do not use crowbars because their soil structure is better than those who do. It was determined that 56% of our producers plant by hand-sprinkling, and 44% plant hemp with pneumatic planting machines that plant wheat. The producers who plant with machines stated that there is a yield loss of 15-20% in manual planting. In the hoeing processes applied to hemp plants, 72% of the producers do hoeing by hand. The first hoeing is done when the plants are 5-10 cm tall, at a depth of 15-20 cm to control weeds and break the crust. The second hoeing is done when the plants are 30-40 cm tall. However, if the first hoeing is done well, they do not need the second hoeing. Other producers do not need hoeing. In enterprises, 40% of those using mechanization in base fertilizer applied fertilizer with a ruffler, and the rest applied fertilizer by hand. Since hemp is tall in top fertilizer, it becomes difficult to use mechanization. 96% of producers apply fertilizer by hand. It was observed that 90% of producers harvest by hand. It was determined that producers carried out 98% of the seed harvest by hand whisking. 2% of producers harvested with their developed machinery and reported that they finished the harvesting process in a shorter time compared to hand harvesting and there was no change in the amount of product.

As a result of the surveys, a SWOT analysis was conducted to determine the strengths and weaknesses, threats, and opportunities of the hemp sector in Samsun. Considering that the history of the enterprises in hemp exceeds 20 years in the surveys, it is seen that there are deficiencies in developing varieties and investing in technology. More resources should be allocated to research and development. Hemp production areas should be expanded, the use of mechanization in agriculture should be increased and producers should be supported. Projects should be produced in private sector-public-university cooperation and strategies should be developed to solve the marketing problem.

REFERENCES

Atakişi, İ. K. (1999). 'Lif Bitkileri Yetiştirme ve Islah'ı. Trakya Üniversitesi, Ziraat Fakültesi Yayınları. Tekirdağ.

Aybek, A., Hurşitoğlu, Ç. (2002). Kahramanmaraş Yöresi Tarım İşletmelerinin Mekanizasyon Özellikleri ve Bu Özellikler Arası İlişkiler. KSÜ Fen ve Mühendislik Dergisi, 5(2), 105-113.

Aytaç, S., Arslanoğlu, Ş. F., & Ayan, A. K. (2018). Suçlu olarak bilinen bitki: kenevir. Current Academic Studies in Agricultural Sciences, 550.

Crini, G., Lichtfouse, E., Chanet, G., & Morin-Crini, N. (2020). Traditional and new applications of hemp. Sustainable agriculture reviews 42: Hemp production and applications, 37-87.

De Meijer, E. P. M., Keizer, L. C. P. (1994). Variation of Cannabis for phenological development and stem elongation in relation to stem production. Field Crops Research, 38(1), 37-46.

Ekiz, E., Er, C., Arslan, N., Kolsarıcı, Ö., Bayraktar, N., Sümer, H. (1989). Kenevir Tarımı ve Mevzuatı. Tarım Orman ve Köyişleri Bakanlığı Yayın Dairesi Başkanlığı, Ankara.

Fidan, M., Süzerer, V., & Onay, A. (2023). Cannabis sativa L.: Origin, distribution, taxonomy and biology. Türk Bilimsel Derlemeler Dergisi, 16(1), 10-28.

Gizlenci, Ş. Acar, M., Yiğen, Ç., Aytaç, S. (2019). Kenevir tarımı. T.C Tarım ve Orman Bakanlığı Tarımsal Araştırmalar ve Politikalar Genel Müdürlüğü Karadeniz Tarımsal Araştırma Enstitüsü Müdürlüğü, Samsun.

Gökdoğan, O. (2012). Türkiye Ve Avrupa Birliği'nin Tarımsal Mekanizasyon Düzeyi Göstergelerinin Karşılaştırılması. Adnan Menderes Üniversitesi Ziraat Fakültesi Dergisi, 9(2), 1-4.

İncekara, F. (1971). Endüstri Bitkileri Islahı I, Lif Bitkileri ve Islahı, Ege Üniversitesi Ziraat Fakültesi. Agonomi-Genetik Kürsüsü, İzmir.

Kara, K. (2013). Lif Bitkileri Yetiştiriciliği ve Islahı. Atatürk Üniversitesi, Ziraat Fakültesi. No:239, Erzurum.

Karamürsel, D. (2010). Afyon'da Erik Üretimi Yapan İşletmelerin Yapısal Durumu ve Gelişme Olanakları, Yüksek Lisans Tezi, Selçuk Üniversitesi Fen Bilimleri Enstitüsü Tarım Ekonomisi Anabilim Dalı, Konya.

Kim, D., Yoo, C. G., Schwarz, J., Dhekney, S., Kozak, R., Laufer, C., & Kim, S. (2021). Effect of lignin-blocking agent on enzyme hydrolysis of acid pretreated hemp waste. RSC advances, 11(36), 22025-22033.

Kim, Y. S., Kim, W. S., Baek, S. Y., Baek, S. M., Kim, Y. J., Lee, S. D., & Kim, Y. J. (2020). Analysis of tillage depth and gear selection for mechanical load and fuel efficiency of an agricultural tractor using an agricultural field measuring system. Sensors, 20(9), 2450.

Klevenhusen, F., These, A., Weiß, K., Gusovius, H. J., & Pieper, R. (2024). Ensiling conditions and changes of cannabinoid concentration in industrial hemp. Archives of Animal Nutrition, 78(3), 242-253.

Lanzanova, C., Giorni, P., Bulla, G., Locatelli, S., Montanari, M., Alberti, I., & Bertuzzi, T. (2024). Investigation on the presence of mycotoxins in seed hemp varieties. Food Additives & Contaminants: Part A, 41(4), 400-409.

Li, S., Stuart J.D., Li, Y., Parnas, R.S. (2010). The Feasibilitiy of Converting Cannabis Sativa l. Oil Into Biodiesel, Bioresource Technology 101(21),8457-8460.

McCormick, R. L., Fioroni, G. M., Naser, N., & Luecke, J. (2024). Properties That Potentially Limit High-Level Blends of Biomass-Based Diesel Fuel. Energy & Fuels, 38(10), 8829-8841.

Ona, A., Vârban, R., Crișan, I., Vârban, D., Pop, C. R., Filip, M., & Stoie, A. (2025). Characterization of hemp (Cannabis sativa L.) raw bast fibers of monoecious versus dioecious cultivars from flowering to senescence: FTIR of lignocelluloses and extract bioactivities. International Journal of Biological Macromolecules, 307, 141852.

Pratiwi, Y. I., Cengiz, M. K., & Mouhin, A. (2023). Cannabis Regulation: A Comparative Study in Indonesia, Turkey, and Morocco. Kosmik Hukum, 23(1), 103-114.

Puyt, R. W., Lie, F. B., & Wilderom, C. P. (2023). The origins of SWOT analysis. Long range planning, 56(3), 102304.

Sayar Yapar, N. S. (2020). Samsun ilinde yürütülmekte olan halk elinde manda ıslahı projesinin yetiştiriciler üzerindeki etkileri. Yüksek Lisans Tezi, Ondokuz Mayıs Üniversitesi, Fen Bilimleri Enstitüsü.

Sayın, C., Mencet, M. N., & Taşçıoğlu, Y. (2010). Bölgesel Kalkınmada Etkisi Olan Unsurların Katılımcı Gzft Analizi İle Belirlenmesi: Antalya İli Döşemealtı İlçesi Örneği. Akdeniz University Journal of the Faculty of Agriculture, 23(1), 31-39.

Shamim, S. M., Huan, Y., Gan, L., & Zhang, S. (2024). A Study on the Preparation and Performance of Ultrafine Powder Made of Industrial Hemp Degumming Residue. Polymers, 16(24), 3473.

Sorrentino, R., Baldi, G. M., Battaglia, V., Raimo, F., Piccirillo, G., & Lahoz, E. (2021). First Report of White Root Rot of Hemp (Cannabis sativa) Caused by Dematophora necatrix in Campania Region (Southern Italy). Plant Disease, 105(10), 3299.

TÜİK, (2019). Bitkisel Üretim İstatistikleri, www.tuik.gov.tr.

Tutek, K., & Masek, A. (2022). Hemp and Its derivatives as a universal industrial raw material (with particular emphasis on the polymer industry)—A review. Materials, 15(7), 2565.

van Klinken, B. J. W., Stewart, M. L., Kalgaonkar, S., & Chae, L. (2024). Health-promoting opportunities of hemp hull: the potential of bioactive compounds. Journal of Dietary Supplements, 21(4), 543-557.

Vijaya Kumar, I. M. K. (2021). Production and quality of industrial hemp (Cannabis sativa L.) in response to water regimes (Doctoral dissertation, University of Tasmania).

Wimbish, K. (2024). Impacts of Regenerative Soil Amendments on Hemp Production (Master's thesis, North Carolina Agricultural and Technical State University).

EXTENDED ABSTRACT

Introduction and Research Questions & Purpose

The resurgence of hemp (*Cannabis sativa* L.) cultivation in Turkey, particularly in the Black Sea region, presents an opportunity to revitalize a historically significant crop with versatile industrial potential. This study focuses on the Samsun province, one of the key regions targeted for the expansion of hemp farming. The aim is to assess the current mechanization level of hemp-producing enterprises and to evaluate their structural and operational characteristics through a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

Methodology

Conducted between 2019 and 2020, the study surveyed 50 licensed hemp producers across five districts in Samsun, utilizing structured questionnaires comprising 30 items. The findings indicate that 92% of hemp cultivation in the region is concentrated in Vezirköprü, predominantly in Narlısaray village. Most enterprises are small-scale, family-run operations with less than 10 decares of land dedicated to hemp production.

Results and Conclusions

Survey results reveal that 56% of producers rely on manual sowing, while 44% use wheat-compatible pneumatic seed drills. A majority (72%) carry out hoeing manually, and 90% perform harvesting by hand. Despite these labor-intensive methods, 58% of producers possess over two decades of experience in hemp farming, indicating strong cultural continuity.

SWOT analysis highlights that the region's agro-ecological conditions and deep-rooted hemp farming traditions are key strengths. However, limited mechanization, regulatory complexities, inadequate seed registration systems, and market access issues—particularly for hemp stalks—are major weaknesses. Opportunities arise from increasing institutional interest, ongoing research by regional institutes, and potential industrial applications such as biofuel and bioplastics. Yet, economic constraints and demographic challenges such as rural-urban migration threaten the sector's long-term viability.

The study concludes that while the Black Sea region holds high potential for sustainable hemp production, strategic interventions are needed. These include mechanization support, targeted subsidies, structured marketing strategies, and stronger public-private-academic collaborations to enhance productivity and ensure value chain integration. The findings offer a foundational roadmap for future policy-making and investment in Turkey’s industrial hemp sector.

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