TARIM EKONOMİSİNDE İLERİ ARAŞTIRMALAR

Editör: Prof.Dr. Mehmet ÖZ

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Tarım Ekonomisinde İleri Araştırmalar

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İÇİNDEKİLER

SESAME ECONOMY AND AGRICULTURE

Mehmet ÖZ[1]

1. INTRODUCTION

Sesame (*Sesamum indicum* L.), one of the oldest known oil crops, is an annual and summer plant. Sesame cultivation has been known in our country since ancient times (Turan ve Goksoy, 1998).

Although it is an ancient cultivated plant, its center of origin has yet to be discovered for sure. Various authors have pointed to Africa as the center of origin of sesame, based on the fact that two-thirds of sesame species are found in Africa and that sesame is economically dominant in this continent. In the same way, it has been stated that sesame originated in Africa and spread to India, China, and Japan through West Asia, and these regions are secondary spread centers. Turkey is a secondary gene center.

There are about 37 species belonging to the genus Sesamum among 16 genera and 60 species of the Pedaliaceae family. However, only Sesamum indicum L. (2n= 26) is cultivated among the species in this genus. About 3000 varieties and ecotypes of cultivated sesame today, primarily spread in tropical and warm belts (Turan ve Goksoy, 1998)..

Hiltebrandt (1932) classified sesame under two subspecies S. indicum ssp. bicarpellatum Hilt. (stems with four angles) and ssp. quadricarpellatum Hilt. (stems with 6-8 angles) according to the number of carpels in the capsule.

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Demir (1962) classified the sesame seeds of Turkey into 12 varieties and 25 cultivar groups, including ssp. bicarpellatum Hilt. and ssp. quadricarpellatum Hilt. Subspecies and found that the most common variety in Turkey is S. indicum ssp. bicarpellatum var. vulgare.

a. Chemical composition of sesame

Sesame seed contains 44-58% oil, 18-25% protein, 13.5% carbohydrate, and 5% ash (Uzun et al., 2008; Were et al., 2006; Elleuch et al., 2007). Environmental conditions and genetic variation have been found to influence oil content and fatty acids (Carlsson et al., 2009). Sesame oil also contains 35 to 54% oleic acid, 39 to 59% linoleic acid, 10% palmitic acid and 5% stearic acid (Wacal et al., 2019). The proportion of linolenic acid is very small (0.5%) (Were et al., 2006).

Sesame oil's oxidative stability is higher than other vegetable oils, even though it contains about 85% unsaturated fatty acids. This may be due to endogenous antioxidants such as lignins and tocopherols (Abou-Gharbia et al., 2000; Aglave, 2018). Sesame seed oil shows exceptionally high oxidative stability compared to soya bean, maize, and many other popular oil crops (Carrasco-Pancorbo et al., 2005; Minioti & Georgiou, 2010).

Furthermore, sesame is an oil rich in many bioactive compounds such as tocopherols, phytosterols and lignans (sesamin, sesamolin, sesamol, sesamol, pinoresinol and lariciresinol, which play a major role) against fat oxidation and contribute to antioxidative activity (Kanu et al., 2010; Senila et al., 2020).

Various metabolites with antioxidant capacity, such as sesamolin, sesamolin, and sesamol, have been identified from seeds and oil. Another essential antioxidant component in sesame is sesamol. This compound is not specifically a lignan but is produced by thermal reduction of sesaminol (Budowski, 1950). Some studies have shown that sesame oil can resist oxidative degradation by the presence of sesamol and its antioxidant effect. This process is related to the thermal transformation sesamolin undergoes to produce sesaminol and sesamol (Fukuda et al., 1994). Similarly, its ability to inhibit lipid oxidation induced by UV or Fe(II) has also been demonstrated.

2. WORLD SESAME ECONOMY

Table 1. Sesame sowing areas, production and yields by country (2021)

COUNTRIES	SOWING AREA (ha)	PRODUCTION (tonnes)	YIELD (kg ha^{-1})
Sudan	3 815 933	1 119 026	293
India	1 809 571	817 000	451
Myanmar	1 406 941	641 730	456
Tanzania	970 000	700 000	721
South Sudan	588 929	182 152	309
Nigeria	496 710	440 000	885
Burkina Faso	450 000	270 000	600
Chad	396 235	196 903	497
China	280 417	457 332	1630
Ethiopia	270 000	190 000	703
Türkiye	24 285	17 657	720

According to 2021 figures, Sudan ranks first in terms of cultivation area and production in world sesame production, followed by India. Regarding yield, China ranked 1st with 1630 kg ha^{-1}, Nigeria ranked 2nd with 885 kg ha^{-1} and Tanzania ranked 3rd with 721 kg ha^{-1}. Sudan ranked first in production and last in yield with 293 kg ha^{-1} (Anonymous, 2021).

a. Export

2022 the total world sesame export value was estimated to be 3.42 billion dollars. The largest exporters of sesame seeds were Sudan (555 million dollars), India (440 million dollars), Nigeria (303 million dollars), Niger (291 million dollars) and Ethiopia (177 million dollars).

Table 2. Countries' share of exports (2022).

Countries	**Proportional share (%)**
Sudan	16.2
India	12.9
Nigeria	8.8
Niger	8.5
Ethiyopia	5.7
Myanmar	5.0
Tanzania	4.5
Burkina Faso	3.4
Chad	3.1
Türkiye	2.2

b. Import

In 2022, the largest importers of sesame seeds were China ($1.22 billion), Turkey ($279 million), Japan ($276 million), South Korea ($169 million) and Israel ($106 million).

Table 3. Countries' share of imports (2022).

Countries	**Proportional share (%)**
China	35.7
Türkiye	8.1
Japan	8.0
South Korea	4.9
Israel	3.1
Vietnam	2.7
USA	2.4
Singapur	2.4
Egypt	2.1
Germany	1.9

According to 2022 figures, Turkiye imported 279 million USD and exported 76 million USD (Anonymous, 2022).

3. SESAME ECONOMY OF TURKEY

Turkey's sesame production in the last 33 years shows serious decreases both in terms of cultivation area and production. In 2000, 509 000 thousand decares were cultivated and 23 800 tonnes of product was obtained. Yield increased from 47 kg/da to 74 kg/da. In 2023, Turkey has a share of 2.7 per thousand and ranks 31st in the world with 16 190 tonnes of sesame production from 220 205 decares of land. The yield was determined as 740 kg ha^{-1} (TUIK, 2023).

Sesame production in our country has decreased by more than 50 percent compared to the 1990s. Foreign trade of sesame and its derivatives worldwide is 3.5-4 billion dollars. According to FAO data, Turkey imported 223 162 tonnes of sesame in 2022. The total value paid for imports is 279 million USD.

Sesame is produced in 31 provinces in Turkey. Antalya ranks first in sesame production in Turkey with 3 567 tonnes (21%), followed by Manisa, Mugla and Usak.

In terms of sesame production by provinces, Antalya ranked first with 3 567 tonnes, followed by Manisa with 3 413 tonnes (Anonymous, 2023).

Table 4. Change in sesame production values of Turkey between years

YEARS	**SOWING AREA (da)**	**PRODUCTION (ton)**	**YIELD (kg ha^{-1})**
1990	850 000	39 000	460
1995	730 000	30 000	410
2000	509 000	23 800	470
2005	424 500	26 000	610
2010	318 242	23 460	740
2015	280 887	18 530	660
2020	256 663	18 648	730
2021	254 862	17 657	690
2022	242 857	17 366	720
2023	220 205	16 190	740

Table 5. Sesame Production in Turkey by Province (tonnes)

Provinces			**Years**			
	2009	**2012**	**2015**	**2018**	**2019**	
Antalya		3 855	3 654	3 348	3 426	3 567
Manisa	1 902	2 206	2 777	3 443	3 413	
Muğla	2 616	2 540	2 628	3 115	3 060	
Uşak	1 356	1 879	2 014	2 140	2 181	
Adana	823	1 427	3 566	1 721	1 526	
Balıkesir	1.293	1 063	795	710	625	
Denizli	493	593	417	501	539	
Osmaniye	418	586	621	453	378	
Şanlıurfa	1.320	277	499	522	323	
Mersin	5 079	740	592	122	100	
Diğer	1 881	1 256	1 207	1 014	1 181	
Toplam	**21 036**	**16 221**		**18 530**	**17 437**	**16 893**

a. Export

Although Turkey is a net importer of sesame, it also exports sesame. Exports of 16.2, 11.9, and 9.7 million dollars were made to Iraq, Syria, and Greece, respectively. These values and rankings vary according to year.

Table 6. Countries and ratios of our country's exports

COUNTRY	**PRICE (million dollars)**	**Rate (%)**
Iraq	16.2	21.1
Syria	11.9	15.6
Greece	9.7	11.4
Israel	4.7	6.2
Poland	4.7	6.1
Italy	3.0	4.0
Japan	2.6	3.4
Lebanon	2.5	3.3

b. Import

Turkey meets approximately 85 percent of its sesame needs through imports. The highest imports were made from Chad, with 103 million dollars, followed by Sudan, with 68.5 million dollars, and Nigeria, with 46.5 million dollars (Anonymous, 2022).

Table 7. Countries and ratios of our country's imports

COUNTRY	PRICE (million dollars)	Rate (%)
Çad	103.0	36.8
Sudan	68.5	24.6
Nijerya	46.5	16.7
Mısır	11.1	3.9
Etiyopya	6.0	2.1
Burkina Faso	4.3	1.4
Togo	3.1	1.1
Gambiya	2.5	0.9

The increasing world population, changing consumption habits, and increasing consumer health awareness have led to the growth of the sesame market in recent periods. In 2019, world sesame production was approximately 6.55 million tonnes, and most of the sesame was produced in Africa and Asia. In 2019, the global market value of sesame was estimated at USD 6.5 billion. The global sesame seed market is expected to reach USD 17.77 billion by 2025. Global sesame production is estimated to increase from 6.5 million tonnes in 2019 to 9.26 million by 2040. In China alone, sesame demand, which was 900 million tonnes in 2019, is expected to reach 2.56 million tonnes in 2040.

In international markets, the average price of sesame seeds was USD 1229/tonne in 2019, with the price of black sesame about 45% higher than white sesame. The price difference is due to the higher production costs of black sesame seeds and the additional demand created by its perceived health benefits. While white sesame is used only as a food flavoring, black sesame is in demand as a food oil, cosmetic and pharmaceutical ingredient (Anonymous, 2022).

In our country, local sesame varieties are predominantly used in sesame production, and it is stated that this situation limits the yield and income increase of the producer. In addition, inadequate soil preparation, deficiencies in sowing techniques, insufficient fertilization, lack of machine harvesting, high labor costs, marketing, wilt diseases caused by diseases and pests (Fusarium spp., Macrophomina spp., etc.) and phytoplasma (Phyllodi disease) cause a decrease in sesame production. The reasons for the lack of development of sesame agriculture in our country are; insufficient sowing, production on small lands, increase in labor costs, and yield losses during harvesting (Dizdaroğlu and Tan, 1995a, b).

4. Morphological characters

a. Root

The sesame plant has a taproot and can go as deep as 100-150 cm. From the taproot, there are numerous lateral roots and sucker hairs on the lateral roots.

Sesame roots are very important for phenology. Sesame plants generally have a strong taproot component and some fibrous roots. However, under different conditions, plants may have a stronger taproot or a stronger fibrous root structure. Usually, the roots are as deep as the plants are tall (Turan & Goksoy, 1998).

Sesame is considered a drought-tolerant species because the root penetrates deep into the soil and finds moisture deep down. If rain or irrigation occurs immediately after sowing, there will be more fibrous root development with shorter taproots in the upper 30 cm of the soil. If a drought follows this, plants may become water-stressed as the moisture in the upper 30 cm is depleted (Langham, 2018).

b. Stem

While the average plant height usually varies between 60-120 cm, it can be between 30-180 cm depending on climatic conditions and genotypes. It can be hairy and glabrous. In bicarpellatum subspecies with two carpels, the stem is 4-cornered, and in quadricarpellatum subspecies with four carpels, 6-8 corners are observed.

Sesame is a branching plant. Leaf axils form branches on the main stem. The frequency of branches increases in the middle nodes of the stem. The branches in the lower nodes of the trunk are opposite, while those in the upper nodes are arranged alternately. Some sesame varieties form more than 2-3 branches. Sesame seeds cultivated in our country are part of a multi-branched group. There may be genotypes that do not branch at all, as well as genotypes with excessive branching. Too much branching is undesirable because it delays the harvest, and the grains are undersized (Turan and Goksoy, 1998).

c. Leaf

Sesame leaves emerge from the nodes on the main stem or branches. Leaf shapes are different; the leaves on the lower nodes are large and broad, while those on the upper nodes are narrow and long. Leaf margins may be toothed or smooth. The leaves are opposite on the main stem until the 3rd and 6th internodes, then alternate towards the tip. Leaves are polymorphic; that is, they differ in shape.

Leaf margins can be sliced, smooth, sometimes serrated, lobed or three-parted. The leaves on the lower parts of the plant are more significant and broader, narrower and longer towards the tip. Leaves may or may not have hairs. The petiole is long on the lower leaves and short on the upper leaves.

d. Flower

The bell-shaped flowers emerge from the leaf axils singly or three together. The flowers of sesame seeds with two carpels are five. The five sepals are united at the base, their tips are separate and pointed, and they are slightly hairy. The colors of the five bell-shaped petals can be white, pink, and purple violet. They are also hairy (Turan and Goksoy, 1998).

The sesame seeds of our country belong to the subgroup with two carpels and have pink flowers. They have five male organs, two of which are long and two of which have short threads. Since one of the male organs is lost before flowering, it appears to have four male organs when it blooms. There is also a female organ with a hairy two-parted apex. In subspecies with four carpels, the number of flower organs can be up to 10. The tepals are 3-4-parted, and the ovary has 4 eyes.

Figure 1: Sesame flower and its parts

Self-fertilisation (autogamy) is dominant in sesame, and foreign fertilization (allogamy) may occur at a rate of 4%. Flowering starts 4-5 weeks after plant emergence. Flowers open early in the morning and fertilize on the same day. They fall off in a few days. The inflorescence shows a spiral characteristic from bottom to top.

The flowers ordinarily open at dawn between 5 and 7 a.m. and fall shortly after the pollen has been viable for about 24 hours. On cloudy or cool days, the flowers may open 3 hours after sunrise. As the flowers open, the stigma separates, becomes receptive, and is profusely covered with pollen from the anthers. The stigma is receptive one day before flower opening and remains receptive for a further two days unless fertilised. Under natural conditions, pollen remains viable for about 24 hours. Although there are exceptions, temperatures below 15 C or above 40 C cause pollen sterility, reduced fertilization, and reduced seed set (Turan and Goksoy, 1998; İşler, 2024).

e. Fruit

The sesame fruit is called a capsule. The capsules are shaped like a rectangular prism, narrowing and tapering at the top and bottom. Each carpel looks like a bag with two compartments, pointed at the ends, with a longitudinal seam in the center. Unlike flowers, the capsules point upwards.

The fruit has 4 eyes in 2 carpels and 8 in 4 carpels. The fruit, which is green before ripening, turns into a brownish-brown color with ripening. At the same time, they crack from their tips and carpel joints. Since the capsules stand upright, seed shedding is not observed if the wind or plants are not shaken. However, since the plant is thoroughly dried during harvesting, seed shedding cannot be prevented (Anonymous, 2024).

Figure 2. Sesame capsule (İşler, 2024; Tan, 2015).

f. Seed

Sesame seeds are arranged in carpels like a string of coins. It is very similar to flax seed. However, they are not slippery and shiny like flax seeds. Seed colors are white, yellow, brown, and black. White-coloured seeds have more oil content. Seeds are pretty small, and their 1000-grain weight varies between 2.5 and 5 g.

Figure 3. Seeds inside the sesame capsule and their arrangement (İşler, 2024; Tan, 2015).

There are 15 sesame varieties in our country (TTSM, 2024).

Tablo 8. Türkiye'de tescilli susam çeşitleri, tescil ettiren kuruluşlar ve tescil yılları

VARIETY NAME	**REGISTRANT**	**REGISTRATION YEAR**
Ozberk 82	Western Mediterranean A.R.I.D.	28.04.1986
Golmarmara	Western Mediterranean A.R.I.D.	28.04.1986
Muganlı 57	Western Mediterranean A.R.I.D.	28.04.1986
Orhangazi 99	Ege A.R.I.D.	28.04.1999
Kepsut 99	Ege A.R.I.D.	28.04.1999
Cumhuriyet 99	Ege A.R.I.D.	28.04.1999
Tan 99	Ege A.R.I.D.	28.04.1999
Osmanlı 99	Ege A.R.I.D.	28.04.1999
Baydar 2001	Western Mediterranean A.R.I.D.	25.04.2001

Aslanbey	GAP A.R.I.D.	15.04.2010
Hatipoglu	GAP A.R.I.D.	15.04.2010
Tanas	Ege A.R.I.D.	11.04.2012
Sarisu	Ege A.R.I.D.	11.04.2012
Boydak	GAP A.R.I.D.	11.04.2012
EQUI2017010	Tekfen A.R.I. ve Marketing J.S.C.	30.04.2020

5. CLIMATE AND SOIL REQUIREMENTS

a. Climate Requirements

The short growing period of sesame as a neutral day plant and the fact that it is very favorably affected by heat and can withstand cold very little shows that it is a plant of the tropical and subtropical climate zone. It requires an average temperature of 26 °C within 90-120 days during germination and fruit formation. The monthly average temperature should not be lower than 20 °C during development. If the temperature difference between day and night is low, the yield of sesame increases. The temperature during the vegetation period is 2700-2800 °C. Its geographical distribution is 25° South and 25° North, but it grows in China, Russia, and the USA at 40° north latitude and in Australia at 30° south latitude. Its altitude limit is more limited than flax and safflower. Despite this, sesame varieties adapted to altitudes of 1250 m, and even 1500 m have been found. At the time of sowing, the soil temperature of the seedbed should be 20-24 °C. It blooms in an average of 42-45 days in ten hours of daylight.

The general temperature range for sesame production is 25°C to 37°C. The favorable temperature for rapid germination, initial growth, and flower formation is 25°C to 27°C, while temperatures below 20°C for any length of time inhibit or delay germination. After emergence, a temperature below 18°C severely retards seedling growth. Low temperatures during flowering can cause sterile pollen production or early flower drop. In contrast, high temperatures of 40°C or above during flowering will severely affect fertilization, resulting in low capsule/fruit numbers (Terefe et al., 2012).

Since it is known to be resistant to drought in many parts of our country, it is cultivated without irrigation. The weather should be dry during the flowering period. Sesame is especially sensitive to hot winds. Sesame can give a good product in places with 500-600 mm annual rainfall. However, yield can be obtained under certain conditions in places with rainfall below 300 mm and above 1000 mm. For maximum yield, it is appropriate that 35% of the rainfall falls from germination to the first bud formation, 45% in the entire flowering period, and the remaining 20% before the seed ripening period.

b. Soil Requirements

It grows well in moderately heavy, humus soils with sufficient organic matter. It can be grown in almost all kinds of soils except clay, calcareous heavy soils, and light sandy soils. It likes lime. It gives a high yield when grown in newly opened field areas. pH 7.0 should be neutral.

c. Crop Rotation

It can be rotated with every cultivated plant. It is sown before wheat in many Mediterranean countries. Because it does not tire the soil much besides its robust root system, it contributes positively to the increase in wheat yield. It is cultivated as a second crop in Southern Anatolia and the Aegean region, as well as mixed cultivation with cotton, maize, and millet, which are regional crops. It provides a good product after hoe crops and legumes. Sesame can be sown consecutively in the same place.

Crop rotation is the systematic and sequential cultivation of different crops in the same field area instead of continuous cropping, where the same crop is sown every year. Crop rotations should be planned to take into account primary considerations such as deep-rooted crops followed by shallow-rooted crops such as sesame, chickpea, and green gram for efficient nutrient uptake and utilization, legumes followed by non-legume crops such as sesame after chickpea/green gram/groundnut to maintain soil fertility and vice versa. Pathogen/nematode-resistant crops and crops requiring intensive irrigation should follow crops susceptible to specific pathogens, parasites (nematodes), and less water, and labor-intensive crops should follow labor-intensive crops. As climate-smart and conservation agriculture production techniques, crop rotation has many benefits, such as higher yields without extra investment, improved soil fertility and microbial activities, reduced accumulation of soil toxicity, and fixation of atmospheric nitrogen to nitrate. Crop rotation also efficiently utilizes soil nutrients and soil moisture, reducing insect pests and disease problems. Considering the impact of climate change on agriculture, farm income can be effectively diversified and sustained (Turan & Goksoy, 1998).

d. Main crop soil preparation

Soil preparation is started in autumn following the preplant harvest. The field is ploughed at a depth of 20-25 cm. As the soil enters the winter plowed, water uptake increases, and the physical properties of the soil improve due to freezing and thawing. If there is grazing in the field due to autumn rains following the first plowing, the soil is cultivated at a depth of 10-15 cm with a crowbar before entering the winter, and the grass is buried deeply. In the spring, when the soil reaches the annealed level, it is either plowed superficially with a plow or, best of all, the soil should be cultivated superficially with a crowbar (cultivator) or a disc harrow at a depth of 10-15 cm.

If the sowing is not to be done with a combined seeder, the fertilizers to be given in the sowing are scattered on the soil with a centrifugal fertilizer machine, also weed killer is applied if necessary, fertilizer and weed killer are mixed into the soil at the sowing depth with disc harrow and harrow and the soil is pressed by pulling the slider and the soil is made ready for sowing. The use of a harrow and plow is also helpful in terms of leveling the soil to a certain extent.

e. Second crop soil preparation

Since second-crop planting is generally done after wheat or barley harvest, the soil is not sufficiently tempered before planting. Firstly, the soil is irrigated, and depending on the air temperature, the soil is cultivated and fertilized at a depth of 18-20 cm within 4-5 days. Fertilizers are spread on the soil with a centrifugal fertilizer machine, a weed killer is applied if necessary, and fertilizer, and killer are mixed into the soil at the sowing depth with a disc harrow and harrow. In order to break the soil thoroughly, the soil is pressed 1 - 2 times with a disc harrow and 1 - 2 times with a harrow, and the soil is ready for planting.

6. SOWIG

The sowing of a plant should be analyzed under the following 5 headings (Turan and Goksoy, 1998; Tan, 2015):

a. Sowing time

Sowing is done in April and May, depending on the region, when the soil temperature reaches 20-24 °C in well-prepared, tempered soil.

b. Sowing frequency

Inter-row distances vary between 40-70 cm, and over-row distances vary between 15-25 cm. Sowing frequency affects the number of plants significantly. After thinning, the number of plants per decare will be 12 500 plants for 40 x 20 cm frequency and 6 666 plants for 60 x 25 cm frequency.

c. Sowing norm

The sowing norm varies between 400-1000 g of seed per decare depending on the preferred sowing method.

d. Sowing method

Broadcast sowing

In broadcast sowing, the seeds are scattered on the prepared soil by experienced people. For the seed to fall into the tempered soil, a light disc harrow and slide should be pulled. 0.8-1 kg seed should be used per decare in scatter sowing.

Seeding with seeder

Row sowing is done with universal or precision sowing machines. The ideal method is the pneumatic sowing machine that can sow at the desired inter-row and over-row frequency.

Another critical process to be considered in sesame sowing is to sow sesame seeds after mixing them with 2/3 of well-washed river sand. Because sesame seeds are very light, it cannot be expected that all of them will fall into the sowing rows with wind and similar factors. As a result, proper sowing cannot be realized. When mixed with sand, the sand grains allow the sesame seeds to fall into the opened rows, allowing a good field emergence.

e. Sowing depth

Since sesame seeds are tiny, they should not be sown too deep. The sowing depth should be adjusted to 1.5-2.5 cm.

7. MAINTENANCE OPERATIONS

a. Breaking of cream layer:

It is a hard surface layer formed due to the re-stacking of soil particles on the surface of the cream layer in the soil. The clotting layer makes it difficult for the shoots emerging from the germinating seed to reach the soil surface. If the driving force of the shoot is lower than the breaking force of the formed crust, the shoot from the seed cannot reach the soil surface and curls downwards under the crust, causing the so-called yellow curl. Such adverse effects of the cream layer can cause great losses at the beginning of crop production (Bal et al., 2011).

After sowing, silty soils with low aggregate formation in fields with low organic matter content are broken down by raindrops' wetting and impact effect and form particles of various sizes. The particles formed in this way become suspended in the water in the environment, and with the cessation of rainfall, they collapse in the environment and form a crust layer. These crust layers are formed in fragile layers, and clay clusters can cover the soil surface completely by stacking parallel to each other (Özdemir, 1995).

In a field, the following conditions must exist for the formation of the cream layer:

* Heavy soil, poor in organic matter
* Rain or irrigation water that has caused ponding
* High temperature

In heavy soils, rapidly removing the water accumulated on the field's surface with the temperature forms the cream layer (Turgay, 2024).

Researchers working on preventing the formation of the cream layer or breaking the formed crust have proposed various suggestions. Various organic and inorganic substances are used to prevent crust formation. The main organic materials are farm manure, waste compost, green manure, and plant residues.

Phosphoric acid, sulphuric acid, hydrochloric acid, triple super phosphate, and perlite added to the soil have an essential place among the inorganic substances used to prevent the formation of crust (Sönmez 1982, Thien 1976). In addition to this, some other researchers have also stated that keeping the soil moist by frequent irrigation is the most commonly used practical method. As a precautionary measure, soil particles should not be broken and pulverized by tillage. In addition, some other researchers reported that passing tools such as hoes, rakes, rollers, thorny bushes, and nailed boards over the soil may help break the crust.

b. Hoeing and thinning

Sesame plants emerge from the field within 7-10 days under favorable soil temperatures. The first development period of the sesame plant is slow. The growth rate starts to increase with flowering. For this reason, the field should not be entered until the plant height is 10-15 cm.

Sesame plants should be thinned at the 6-leaf stage of the crop to maintain the desired plant population, facilitate exposure to sunlight to avoid shading effects, and ensure adequate nutrient and moisture availability. Weak and diseased plants should be removed during thinning.

Since the root is delicate and weak in development, weeds can suppress it. The first hoeing is done when the plant is 10-15 cm tall. If one hoe is deemed sufficient, thinning is also done with this hoe at the desired inter-row distance. Since the roots are still weak and do not go deep, the first hoeing should be done very shallowly and carefully. The second hoeing is done when the plant grows 20-25 cm in height, and the throat-filling process is also carried out. Generally, two hoes are sufficient for sesame during the growing period. Then, depending on the weed situation in the field, hoeing is done between the rows with a hand hoe or hoeing machine. Thinning is done, whereas sowing is done with a universal seeder. After the plant height reaches

40-50 cm, it should not be entered into the field to prevent the flowers from falling before fertilisation.

c. Weed control

Weeds compete with cultivated plants regarding mineral nutrients, water, light, and space, and they cause yield losses. These losses vary depending on the cultivated plant variety, environmental conditions, weed species and densities, and the development period of the cultivated plant and weeds. In addition to these direct losses, there are also indirect damages. The main damages are a decrease in the quality of the product, a decrease in seed value, and deterioration of technological properties. Other indirect damages include the fact that weeds make harvesting difficult and that they provide shelter, breeding, and feeding places for many disease agents and harmful insects, causing an increase in their damage in the field. In order not to reduce the yield in sesame cultivation areas, weeds in the field must be controlled.

Cultural Measures

Subsoil organs of perennial weeds emerging during tillage should be collected, removed from the field, and destroyed.

Weeds growing after plowing should be removed with tools such as a crowbar cultivator and harrow.

Sowing time suitable for the region should be taken into consideration.

Weed-free seed should be used.

Tools and equipment that are not contaminated with weed seeds should be used in the field.

Crop rotation should be applied.

d. Fertilization

Taking into account the growing period of sesame, fertilizer should generally be applied before sowing. Farm fertilizer must also be applied to the previous crop. It has been observed that commercial fertilizers increase the yield and quality of sesame. In our country, 25-30 kg of triple superphosphate, 20-25 kg of ammonium sulfate, and 10-15 kg of potassium sulfate per decare under irrigated conditions are suitable. Only superphosphate fertilizers can be given under dry conditions.

All of the phosphorus and potassium and half of the nitrogen should be given before the soil preparation for sowing. The other half of the nitrogen is given before the first watering. Some farmers in Çukurova use 3-4 kg nitrogen, 3 kg phosphorus, and 3 kg potash per decare from triple or double fertilizers. Nitrogen and phosphorus consumption of the plant is not high compared to other plants. Nitrogen has a positive effect on seed yield when the plant is well-developed. Phosphorus, on the other hand, increases the endurance of the plant and provides a homogenous ripening.

e. Irrigation

Sesame is a plant resistant to drought. In our country, sesame is generally grown without Irrigation. However, since irrigation significantly increases yield, the irrigated sesame area has recently increased in the southern and western regions. Especially if the weather is arid during the development period, the yield increases greatly with irrigation. It requires 250-300 mm of water during the growing period. The first water is given before flowering, during flowering, and during capsule ripening in the following irrigations. The number of irrigation is between 1-3.

f. Control of diseases and pests

The primary diseases seen in the sesame plants are wilt disease, sesame bacterial wilt, leaf spot disease, and sesame Alternaria disease. Seed spraying should be done before sowing against these diseases. Sesame pests may vary according to the plant's development periods. The main pests of sesame are the grizzly worm after sowing, the sesame moth during the seedling period, and the whitefly after flowering. Chemical control should be carried out against these pests in inappropriate periods.

Some of the disease organisms are carried on the seed. Using disease-free seed and treating it with a fungicide before sowing is recommended. Aflatoxin contamination can occur in the field before harvest, during harvest, and post-harvest handling processes such as sun drying, storage, and transporting the crop in the field. Proper drying should occur until the moisture content is reduced to 10%.

Phytoplasma in sesame Phyllody Disease

The disease is caused by the infection of sesame plants by a smaller organism than the bacteria called phytoplasma. It causes deformed and inefficient flower and capsule formation in diseased plants, and yield cannot be obtained.

Symptoms: Different symptoms of phyllody disease can be seen in diseased plants.

The main symptom is seen in flowers. The whole flower turns green and grows abnormally. Flower organs become differentiated.

The plant's normal development is disturbed by abnormal small shoot development and excessive leafing.

The formation of multiple shoots with thin leaves and witches' broom-like plants.

Figure 4. Symptoms of phyllody

Small deformed capsules, cracked capsules, germination of the seed in the capsule, black-coloured discharge on leaves and flowers, and yellowing of all plants may be observed.

The struggle

There is no effective chemical against the disease.

To prevent the transmission of the disease from diseased plants to healthy plants, leaf fleas should be controlled (Ay et al., 2014).

8. HARVESTING AND THRESHING

To decide on sesame harvest, it is essential to determine the harvest maturity period. Since the formation of flowers and capsules in sesame plants takes place from bottom to top, they cannot reach harvest maturity simultaneously. Therefore, the harvest time should be determined by checking the plants in the field. **In these controls:**

Yellowing of the leaves and capsules of the plants,

Partial shedding of leaves,

Cessation of flowering,

When the lower capsules are broken by hand, if the seed color shows signs of turning dark yellow in white grains and light brown in brown grains, it is understood that it is harvest time.

If these symptoms are observed, sesame harvesting is started. It is risky to harvest with a machine because the capsules do not ripen simultaneously in sesame plants, and the capsules crack and shed grains when delayed.

In our country, sesame harvesting is usually done by hand. In manual harvesting, the plants are uprooted by hand or cut close to the soil, but since the plant continues to develop for a while after harvesting, manual uprooting is preferred.

Since the harvested plants continue to develop, 10-25 plants are tied together and pressed on flat, clean ground with the root parts on the bottom and the head parts on the top. These bundles, which remain under pressure for about a week, are placed on concrete or flat ground with 8-10 bundles together and tied at the top. This process is called ‘tokurcun (sesame bunches)’. The tokurcun period lasts approximately 8-15 days.

The dried bundles are prepared for threshing. Clean tarpaulin or nylon covers are laid on the threshing area, and the sheaves are carried there. The bunches are taken under the armpit with their roots upwards, and the seed is slowly tapped with the help of a stick to make it fall out of the capsules. This process is called shaking. Shaking is continued until there are no seeds in the bundles. If capsules are formed on the upper nodes that have not yet dried and cracked, these bundles are left to dry again. After a few days of drying, the bunches are shaken again to remove the seeds remaining in the capsules. During the shaking process, the seeds should not be splashed outside the threshing floor, and care should be taken not to mix the soil in the plant roots with the seeds. After the threshing process is completed, the seeds are blown in the wind or with the help of a fan to clean the seeds from leaves, capsule pieces, husks, stones, and soil. The cleaned seeds are dried again for 1-2 days. In our country, 40-100 kg/da yield is obtained from sesame under normal conditions (Turan & Göksoy, 1998).

Figure 5. Sesame bunches (Tan, 2015).

The dried and cleaned seeds are stored in cloth or jute sacks. Storage conditions such as temperature, ventilation and humidity are very important for properly storing seeds. Before storage, the storage area should be whitewashed and disinfected, and a cool, dry, and airy environment should be created. Sacks should be stacked on wooden grids. For long-term storage below 20 °C, the moisture content of the seeds should be 8-9 % at most. If the humidity of the storage area exceeds 75%, it may cause mold and mildew problems. For this reason, if the storage conditions are higher than the desired level, the seed should be ventilated, and the storage conditions should be adapted (Anonymous, 2015).

9. SESAME BREEDING

(Turan and Goksoy, 2024; İşler, 2024)

a. Aims of breeding

High seed yield

Oil yield and content

Closed encapsulation

Disease resistance

Pest resistance

High harvest index

Increasing of adaptation

b. Sources of variation in sesame

Old varieties

Mutated plants of existing varieties

Wild relative species

Local populations

Opened generations obtained from crossbreeding

Local types (İşler, 2024).

c. Breeding Methods (Turan & Goksoy, 1998)

As mentioned before, sesame has a wide variety of forms worldwide. Our country also has a decadent variety richness, constituting an essential source for breeding studies. Breeding methods Since sesame is a self-fertilised plant, breeding methods of self-fertilised plants can be used in sesame breeding. On the other hand, obtaining thousands of seeds from a sesame plant makes breeding studies very easy.

c.1. Selection breeding

Peasant populations consisting of different phenotypes can be improved by mass selection method in a few years and given to farmers as seed. For this purpose, plants with the desired phenotypes are taken, and their seeds are mixed, and the others are eliminated. This phenotypic selection process is repeated in the material that is mixed and grown again next year. By repeating this process for several years, highly productive and high-quality varieties can be developed and given to the farmer. Undoubtedly, the success of selection depends on the high degree of heritability.

If each population has a much richer genetic variability and a purer seed is desired to be obtained, this time, the pure selection method is used. In the selection work lasting 4-5 years, the progeny of each selected plant are checked separately in the progeny rows. Those that show expansion and do not have the desired characteristics are eliminated.

c2. Combination breeding

Combination breeding combines one or more desirable traits found in different cultivars of cultivated or wild plants into one plant. After crossing parental varieties containing desirable traits, selection starts from the F2 generation and is continued until the desirable types become homozygous. In the F2 and later generations, one of the pedigree, bulk pedigree or bulk selection methods, and, mainly, the pedigree selection method is used.

c3. Three-flowered sesame breeding

It is suggested that plants forming three flowers in each leaf axil yield more. In addition, the difference between the first and last capsule ripening times is shorter in three-flowered varieties. In the crosses made with three and one flowered varieties, it was found that F1 was single flowered and in F2, single flowered:three flowered types were produced in the ratio of 3:1. As it is seen, single three floweredness is managed by a dominant practical gene pair, and this situation facilitates the breeding work to be done. As a matter of fact, it is possible to catch three-flowered genotypes easily in the F2 generation. If they contain other desirable agronomic and technological traits, they can be selected and homozygotised up to F4-F5.

c4. Closed capsule sesame breeding

Closed-capsule sesame breeding is of great importance in terms of high yield and mechanization, especially harvest mechanization. The first mutant type with closed capsules was found by Langham in Venezuela in 1943. Open capsularity is dominant to closed capsularity and this character is managed by a single pair of young. However, the gene governing closed capsular is in linkage (pleiotropy) with genes governing some bad characteristics such as infertility, low yield, and curvature of the style. This situation necessitates the backcrossing method in the breeding of closed-capsule and, at the same time, high-yielding varieties. In addition, to break the linkage mentioned above, it is necessary to make a large number of crosses and develop and control many progeny.

c5. Mutation breeding

After the discovery of closed capsule types by mutation, mutagens have been widely used to solve breeding problems, especially in terms of disease resistance. As in other oilseeds, sesame also shows an excellent resistance to X-rays. Therefore, the intensity and irradiation time of the rays used as mutagen should be kept high. Seeds treated with mutagens must be sown immediately because they may lose their germination power significantly. Mutant types are first encountered in the M2 generation. Mutant types suitable for the purpose can be purified by using one of the previously suggested selection methods, especially the pedigree method.

In most mutation studies, it has been observed that different types have emerged concerning a large number of characters ranging from leaf shape and color to seed oil content.

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TR72 BÖLGESİNDE BAKLAGİL YETİŞTİRİCİLİĞİNİN ÖNEMİ VE BAKLAGİL DESTEKLEMELERİ

Nizamettin ERBAŞ[1]

1. GİRİŞ

Tarımsal üretim doğrudan doğa şartlarına bağlı olup, doğadan oldukça etkilenmektedir. Doğa koşulları tarım için uygun olduğunda, tarımsal üretim olumlu etkilenmekte, kötü doğa koşullarında ise olumsuz etkilenmektedir. İşte tarımsal üretimdeki risk ve belirsizlikler ile sektörün stratejik özelliği, tarımın sürekli desteklenmesi gerektiğini ortaya koymaktadır.

Tarım sektörü insanların en temel ihtiyaçlarını karşılayan yegane sektördür. Nüfusun asıl gıda ve besin kaynağıdır. Sağlıklı bir nüfusun korunmasına yardımcı olur. Tarım tüm ekonomiler için halen önemli bir sektördür. Nüfusa istihdam olanağı sağlar, yoksulluğu ortadan kaldırır ve ekonominin büyümesine katkıda bulunur (Korkmaz, 2023; Erbaş, 2016). Bu bakımdan tarımda sürdürülebilirliğin sağlanması önemlidir.

Söz konusu özellikler nedeniyle tarım sektörü diğer sektörlerden belirgin şekilde ayrılmaktadır. Zaten tarımın stratejik bir sektör olmasının nedeni de bunlardır. Stratejik olma, tüm tarımsal faaliyetler için söz konudur.

Baklagiller yarı kurak bölgelerde ve farklı iklim koşullarında yetiştirilmektedir. Yağmur bile beslenmesi için yeterli olmaktadır. Baklagiller besin açısından yoğun ürünlerdir ve en ucuz protein kaynağıdırlar (Hazra ve Basu, 2023). Yalnızca insan beslenmesi için önemli olmayıp, aynı zamanda tarımın sürdürülebilirliği için de önemlidir. Çünkü baklagiller daha az suya

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ihtiyaç duyarlar, daha az girdi gerektirir ve aynı zamanda atmosferik nitrojeni de (N) sabitlerler (Bhat vd., 2022).

Bakliyat uluslararası ticarete konu olup, üretim ve tüketimde tahılların yerine geçmektedir. Tahıllar gibi bakliyatlar da depolanabilir ürünlerdir. Diğer bitkisel ürünlerle karşılaştırıldığında bakliyatın iki önemli faydası; azotu sabitlemeleri (üretim katkısı) ve protein bakımından zengin olmalarıdır (tüketim faydası) (Vanzetti vd., 2017). Yaygın olarak fakirin eti olarak adlandırılırlar (Reddy vd., 2013).

Baklagillerin su tüketimleri çok az olduğu için, baklagil tarımı ile yeraltı suyu korunmaktadır. Çok kurak koşullarda bile baklagil yetiştirilebilmektedir. Bitkisel ürünler içinde kurak koşullara en dayanıklı ürün baklagillerdir.

Kalkınma ajansları, yeni proje ve teşvikler ile sorumlu oldukları bölgelerin kalkınmasını teşvik edici destek programları ve proje çağrıları yürüten kamu tüzel kişiliğine haiz kuruluşlardır. Türkiye'de faaliyet gösteren kalkınma ajanslarından biri de Orta Anadolu Kalkınma Ajansıdır. Orta Anadolu Kalkınma Ajansının faaliyet alanı Kayseri, Sivas ve Yozgat illeri olup, bu bölge TR72 bölgesi olarak adlandırılmaktadır.

TÜİK verilerine göre, TR72 bölgesinde tarım sektörünün toplam istihdam içindeki payı %23.6 (TÜİK, 2023a) ve toplam gayrisafi yurt içi hasılası içindeki payı ise %10.7'dir (TÜİK, 2022a). Bu oranlar Türkiye ortalamasında ise sırasıyla, %14.9 ve %6.2 olup, bölgede tarımın ekonomiye katkısının Türkiye ortalamasından daha yüksek olduğu görülmektedir. Baklagil tarımının önem arz ettiği bölgede, 2023 yılında 103.357 ha alanda toplam 154.476 ton bakliyat üretimi gerçekleşmiştir. Toplam ekili alanın %7.1'inde baklagil tarımı yapılmaktadır. Bölge, bakliyat üretimi bakımından Türkiye bakliyat üretiminin %11.9'unu karşılamaktadır. Bu çalışmada, TR72 bölgesinde baklagil tarımının önemi, Türkiye'deki payı ve baklagil desteklemeleri incelenmiş, baklagil tarımını iyileştirmenin araçları önerilmiştir.

Çalışma dört bölümden oluşmaktadır. Çalışmanın ilk bölümü genel bilgilerin verildiği giriş bölümünden oluşmaktadır. İkinci bölümde, çalışmanın ana materyalinin ve metodolojinin açıklandığı materyal ve yöntem verilmiştir. Üçüncü bölümde verilen araştırma bulguları ve tartışma, detaylı olarak açıklanmış ve yorumlanmıştır. Dördüncü ve son bölümde ise, çalışma uygun çıkarım ve öneriler ile sonuçlanmıştır.

2. MATERYAL VE YÖNTEM

Bu çalışmanın ana materyali, Türkiye İstatistik Kurumunun (TÜİK) istatistiklerinden düzenlenen verilerden oluşmaktadır. Veriler 2010-2023 dönemini kapsamaktadır.

Elde edilen veriler, tablolar halinde düzenlenmiş, yorumlanıp değerlendirilmiştir. Aynı tablolarda TR72 bölgesine ait veriler Türkiye geneli ile karşılaştırılmıştır.

3. BULGULAR

3.1. TR72 Bölgesinde Baklagil Tarımı ve Türkiye'deki Payı

Çalışmada, öncelikle TR72 bölgesinde tarım alanının kullanım durumu belirlenmiş ve Tablo 1'de verilmiştir. Buna göre, TR72 bölgesinde toplam tarım alanı varlığı 1.996.137 ha (TÜİK, 2023b) olup, Türkiye toplam tarım alanının %8.3'ünü oluşturmaktadır. Bölgede en fazla tarım alanına sahip il Sivas olup, ilde toplam 783.639 ha tarım alanı bulunmaktadır. Tarım alanı bakımından Sivas ilini 610.003 ha ile Yozgat ili ve 602.495 ha ile Kayseri illeri izlemektedir.

Tablo 1. TR72 Bölgesinde Tarım Alanının Kullanım Durumu (Çayır ve mera alanları hariç) (2023)

TR72 Bölgesi	Tahıllar ve diğer bitkisel ürünlerin alanı (da)		Sebze bahçeleri alanı (da)	Meyve bahçeleri alanı (da)	Toplam tarım alanı (da)
	Ekilen alan (da)	Nadas (da)			
Kayseri	4 520 889	949 635	356 351	198 077	6 024 952
Sivas	5 268 868	2 506 740	11 167	49 613	7 836 388
Yozgat	4 792 573	1 232 093	29 498	45 865	6 100 029
Toplam	14 582 330	4 688 468	397 016	293 555	19 961 369

Çalışmada, TR72 bölgesinde baklagil ekim alanı ve Türkiye'deki payı da incelenmiş ve Tablo 2'de verilmiştir. Tablo incelendiğinde, Türkiye'de yeşil mercimek tarımının büyük ölçüde TR72 bölgesinde yapıldığı görülmektedir. Bölgede 2023 yılında işlenen tarım alanının %5.2'sinde baklagil tarımı yapılmaktadır. Bölgede yeşil mercimek ekim alanı Türkiye toplam yeşil mercimek ekim alanının %39.8'ini (TÜİK, 2023c) oluşturmaktadır. Türkiye'de aldığı pay açısından incelendiğinde, yeşil mercimek ekim alanını %17.6 ile kuru nohut ve %5.2 ile kuru fasulye ürünleri izlemektedir.

Bölgede yeşil mercimek ekim alanının %95.9'u Yozgat ilinde bulunmaktadır. Geriye kalan %2.2'i Sivas ve %1.9'u Kayseri illerine aittir.

Tablo 2. TR72 Bölgesinde 2010-2023 Dönemi Baklagil Ekim Alanı ve Türkiye'deki Payı

Yıllar	Baklagil	ORAN Kalkınma Ajansı Bölgesi				Türkiye'deki payı (%)
		Kayseri (da)	Sivas (da)	Yozgat (da)	Toplam (da)	
2010	K. Mercimek	-	1 166	208	1 374	0.1
	Y. Mercimek	1 539	1 108	28 590	31 237	13.7
	K. Nohut	49 136	118 528	232 050	399 714	38.7
	K. Fasulye	17 850	8 510	11 280	37 640	3.6
2015	K. Mercimek	-	205	140	345	0.0
	Y. Mercimek	1 405	445	28 262	30 112	18.4
	K. Nohut	61 174	58 035	194 598	313 807	8.7
	K. Fasulye	15 625	7 279	5 299	28 203	3.0
2020	K. Mercimek	200	1 282	13 851	15 333	0.7
	Y. Mercimek	2 327	1 729	155 511	159 567	42.2
	K. Nohut	95 138	73 884	712 618	1 594 258	31.2
	K. Fasulye	24 069	3 151	7 119	34 339	3.3

2021	K. Mercimek	25	385	12 202	12 612	0.5
	Y. Mercimek	2 523	6 003	185 022	193 548	40.2
	K. Nohut	118 858	71 505	657 372	847 735	17.4
	K. Fasulye	35 903	4 068	10 457	50 428	9.3
2022	K. Mercimek	-	347	7 417	7 764	0.3
	Y. Mercimek	2 653	4 080	173 935	180 668	42.2
	K. Nohut	137 692	86 549	517 059	741 300	16.2
	K. Fasulye	29 797	6 770	8 752	45 319	4.7
2023	K. Mercimek	-	331	2 064	2 395	0.1
	Y. Mercimek	3 405	3 877	170 807	178 089	39.8
	K. Nohut	161 867	85 921	559 655	807 443	17.6
	K. Fasulye	33 382	5 408	6 853	45 643	5.2

Tablo 3'te, TR72 bölgesinde bakliyat üretimi ve Türkiye'deki payı verilmiştir. TR72 bölgesinde 2023 yılında toplam 154.476 ton bakliyat üretilmiştir (TÜİK, 2023d). Bakliyat üretiminin %77.7'sini kuru nohut, %13.2'sini yeşil mercimek, %8.9'unu kuru fasulye ve %0.2'sini de kırmızı mercimek oluşturmaktadır. 2023 yılı verilerine göre, bölgede toplam 119.971 ton kuru nohut, toplam 20 378 ton yeşil mercimek, toplam 13.843 ton kuru fasulye ve toplam 284 ton kırmızı mercimek üretilmiştir.

Tablo 3. TR72 Bölgesinde 2010-2023 Dönemi Bakliyat Üretimi ve Türkiye'deki Payı

Yıllar	**Bakliyat**	**ORAN Kalkınma Ajansı Bölgesi**				**Türkiye'deki payı (%)**
		Kayseri (ton)	**Sivas (ton)**	**Yozgat (ton)**	**Toplam (ton)**	
2010	K. Mercimek	-	169	79	248	0.1
	Y. Mercimek	164	139	3 199	3 502	13.8
	K. Nohut	5 171	16 323	26 783	51 277	9.7
	K. Fasulye	2 827	1 279	1 331	5 437	2.5
2015	K. Mercimek	-	27	19	46	0.01
	Y. Mercimek	167	56	3 458	3 681	18.4
	K. Nohut	7 190	5 135	22 510	34 835	7.6
	K. Fasulye	3 153	828	733	4 714	2.0
2020	K. Mercimek	35	140	1 261	1 436	0.4
	Y. Mercimek	275	176	16 953	17 404	41.0
	K. Nohut	9 918	6 489	86 417	102 824	16.3
	K. Fasulye	6 551	338	872	7 761	2.8

2021	K. Mercimek	4	35	772	811	0.4
	Y. Mercimek	237	449	16 730	17 416	49.8
	K. Nohut	15 218	5 105	68 433	88 756	18.7
	K. Fasulye	9 343	399	1 942	11 684	3.8
2022	K. Mercimek	-	32	810	842	0.2
	Y. Mercimek	229	340	18 965	19 534	43.4
	K. Nohut	16 210	6 961	67 115	90 286	15.6
	K. Fasulye	8 418	946	1 725	11 089	4.1
2023	K. Mercimek	-	39	245	284	0.1
	Y. Mercimek	346	260	19 764	20 378	40.8
	K. Nohut	22 392	8 577	68 632	119 971	20.7
	K. Fasulye	11 574	849	1 420	13 843	5.8

2010-2023 dönemini kapsayan son 13 yılda kuru nohut üretimi 2,3 kat, yeşil mercimek üretimi 5,8 kat, kuru fasulye üretimi 2,5 kat ve kırmızı mercimek üretimi 1,1 kat artmıştır. Yeşil mercimek üretimi Türkiye yeşil mercimek üretiminin %40.8'ini ve kuru nohut üretimi Türkiye nohut üretiminin %20.7'sini karşılamaktadır.

Çalışmada, bölgede tarımın toplam istihdam içindeki payının %23.6 ve toplam gayrisafi yurt içi hasılası içindeki payının ise %10.7 olduğu belirlenmiştir. Bu oranlar Türkiye ortalamasında ise sırasıyla %14.9 ve %6.2 olup, bölgede tarımın ekonomiye katkısının Türkiye ortalamasından daha yüksek olduğu görülmüştür. Bölgede toplam 323.443.080 bin TL olan gayrisafi yurt içi hasılanın 34.458 094 bin TL'sini tarımsal üretim değeri (TÜİK, 2022b) oluşturmaktadır. Tarımsal üretim değeri içinde bakliyatın önemli pay aldığı bölgede, 103.357 ha. alanda, toplam 154.476 ton bakliyat üretimi gerçekleştirilmiştir. Bölgede, toplam ekili alanının %7.1'inde baklagil tarımı yapılmaktadır. Bakliyat üretimi Türkiye bakliyat üretiminin %11.9'unu karşılamaktadır. Bu bilgiler, TR72 bölgesinde baklagil tarımının bölgenin tarım ekonomisinde önemli rol aldığını göstermektedir.

3.2. Bakliyat Desteklemeleri

Diğer sektörlere göre tarım stratejik bir özellik arz etmektedir. Dünyada hemen hemen tüm ülkeler tarımı çeşitli şekillerde desteklemekte ve sübvanse etmektedir.

Türkiye'de bitkisel üretimi artırmak, verim ve kaliteyi yükseltmek ve sürdürülebilirliği sağlamak için çiftçileri desteklemeye yönelik, "Bitkisel Üretimi Destekleme Ödemesi" yapılmaktadır. Tarımsal destekler ile üretim maliyetlerinin bir kısmının karşılanması ve üreticinin ek gelir elde etmesi amaçlanmaktadır.

Türkiye'de bakliyat destekleme fiyatları her yıl Tarım ve Orman Bakanlığı tarafından ürün hasadından önce açıklanmaktadır. Bu kapsamda, 2010-2023 yıllarında bakliyat destekleme fiyatları Tablo 4'te verilmiştir. 2023 üretim sezonu için destekleme fiyatları sırasıyla; kırmızı mercimekte 12,27 TL/kg, yeşil mercimekte 20,86 TL/kg, kuru nohutta 23,72 TL/kg ve kuru fasulyede 32,38 TL/kg olarak uygulanmıştır (TÜİK, 2023e). Destekleme fiyatları son 13 yılda kırmızı mercimekte 8,2 kat, yeşil mercimekte 9,9 kat, kuru fasulyede 13,5 kat ve nohutta 14,8 kat artmıştır.

Tablo 4. Türkiye'de 2010-2023 Döneminde Bakliyat Destekleme Fiyatları

Yıllar	K. Mercimek (TL/kg)	Y. Mercimek (TL/kg)	K. Fasulye (TL/kg)	K. Nohut (TL/kg)
2010	1,49	2,11	2,40	1,60
2011	1,38	2,07	2,51	2,11
2012	1,28	2,14	2,91	2,68
2013	1,27	2,11	3,28	2,46
2014	1,58	2,17	3,69	2,33
2015	1,96	2,64	3,39	2,61
2016	2,49	3,02	3,44	3,68
2017	2,33	3,26	3,98	5,46
2018	1,94	2,96	4,80	4,80
2019	2,35	3,44	6,42	3,41
2020	3,39	4,47	8,16	3,82
2021	5,38	5,97	8,89	6,23
2022	10,59	13,17	18,06	14,79
2023	12,27	20,86	32,38	23,72

Türkiye'de birçok ürüne uygulanan tarımsal desteklemeler, üretimde arz açığını kapatılmasına ve üretici gelirinin korunmasına yardımcı olmaktadır. Bakliyat desteklemeleri mazot desteği, gübre desteği, toprak analizi desteği ve fark ödemesi desteği olarak yürütülmektedir (Tablo 5). Bölgede, 2023 yılında bakliyat üreticilerine kg başına 50 krş fark ödemesi (prim) desteği, dekar başına 103 TL mazot desteği ve 21 TL gübre desteği ile analiz başına 50 TL toprak analizi desteği (RESMİ GAZETE, 2023) yapılmıştır. 2010-2023 dönemini kapsayan 13 yılda mazot desteğinde 27,5 kat, gübre desteğinde 4,4 kat ve fark ödemesi (prim) desteğinde ise 5 kat artış gerçekleşmiştir.

Burada toprak analizi desteği, her 50 dekar araziye kadar analiz başına ödenen destek miktarını ifade etmektedir. Prim ödemesi desteği ise, doğrudan devlet ödemelerinden oluşmakta ve havza bazlı alanlarda üretim yapan çiftçilere ödenen fark ödemesini ifade etmektedir. Yeraltı ve sulama kısıtının yaşandığı havzalarda fark ödemesi desteği ilave %50 olarak uygulanmaktadır. Ödeme oranı, ürünün hedeflenen fiyatı ile piyasada gerçekleşen fiyatı arasındaki farkı temsil etmektedir. Üreticilerin gelirini güvenceye alan prim desteklerinin asıl amacı, üretimde arz açığı yaşanan ürünlerde fark ödemeleriyle yeterli miktarda ürün elde etmeye çalışmaktır. Bakliyat ve diğer tarımsal desteklemeler her yıl Resmi Gazetede yayımlanarak yürürlüğe girmektedir.

Tablo 5. Verilen Destekler

Yıllar	Mazot desteği (TL/da)	Gübre desteği (TL/da)	Toprak analizi desteği (TL/analiz)	Fark ödemesi (prim) desteği (TL/kg)
2010	Toplam 30 TL/da			
2011	3,75	4,75	2,5 TL/dekar	0,10
2012	4,0	5,0	2,5 TL/dekar	0,10
2013	4,3	5,5	2,5 TL/dekar	0,10
2014	4,6	6,0	2,5 TL/dekar	0,10
2015	4.85	6,6	2,5 TL/dekar	0,20
2016	11		-	0,30
2017	11	4	40	0,30
2018	14	4	40	0,50
2019	22	4	40	0,50

2020	22	4	40	0,50
2021	24	8	40	0,50
2022	75	21	50	0,50
2023	103	21	50	0,50

4. SONUÇ

Tarım tüm ekonomilerde her zaman güçlü bir konuma sahiptir. Ulusal çıktı ve istihdam yaratma açısından tarım sektörü önemlidir. Tarım bir ülkeyi dışa bağımlılıktan kurtarır. Bu nedenle devlet her zaman tarımı desteklemelidir. Bölgede önemli olması açısından baklagil tarımını teşvik etmelidir. Bölgede baklagil tarımını teşvik etmek için devletin alacağı önlem ve politikalardan bazıları aşağıda verilmiştir:

- Tarımsal alanda eğitim veren üniversitelere daha fazla araştırma yapmaları için daha fazla fon sağlamalıdır.

- Ziraat Bankası bakliyat üreticilerine makul bir faiz oranı ile kredi temini için rasyonel bir politika geliştirmelidir.

- Devlet ihracatta tarımın tabanını çeşitlendirerek, bakliyatın ihracat kapasitesinin artırılmasını temin etmelidir.

- Bakliyatta üretim kapasitesini artırmaya yardımcı olmak için çiftçilere modern üretim tekniklerinin kullanımı konusunda eğitim verilmelidir.

- Baklagil üreticileri girdi konusunda sübvanse edilmelidir.

- Bakliyatın daha fazla ihraç edilmesi sağlanmalıdır.

- Baklagillerde verimlilik artışına yatırım yapılmalıdır (altyapı geliştirme, düşük maliyetli teknolojilerin geliştirilmesi, araştırma ve geliştirme yatırımları vb.).

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