

**NON-WOOD
FOREST
PRODUCTS**

CAROB

VALUE CHAIN ANALYSIS





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Non-Wood Forest Products: Carob Value Chain Research Report was published for the Nature Conservation Centre (DKM) by Yaşama Dair Vakfı under the project "Integrated Approach to Management of Forests in Turkey, with Demonstration in High Conservation Value Forests in the Mediterranean Region" which is conducted by the Ministry Of Agriculture And Forestry, General Directorate of Forestry in cooperation with the United Nations Development Programme (UNDP) with the financial support of the Global Environment Facility (GEF).



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TAG METHOD

Non-Wood Forest Products: Carob Value Chain Research Report was conducted for the Nature Conservation Centre (DKM) which is one of the project partners by Yaşama Dair Vakfı in order to provide an overview of production process of carob from forest to market at the Gülnar and Gazipaşa Forest District Directorates under the project on “Integrated Approach to Management of Forests in the Mediterranean Region” which is conducted by the General Directorate of Forestry in cooperation with the United Nations Development Programme (UNDP) with the financial support of the Global Environment Facility (GEF).

15 interviews were conducted under the research between October 2016 and December 2016 in Antalya, Mersin, İzmir and İstanbul.

The interviews were respectively conducted with Forest Regional Directorates’ Non-Wood Products and Services Sections, Forest District Directorates, forest villagers, gatherers, mukhtars, middlemen, spice traders and the managers of drying – processing facilities. Following the interviews at local level, in-depth interviews were conducted with the Aegean Exporters’ Association in order to understand carob export process and with the spice sellers at Spice Bazaar in İstanbul to track the end product that is offered to the end consumer at the domestic market. In the scope of the research, interviews were conducted with the spice sector representatives.

Finally, official statistics of the Ministry of Agriculture and Forestry and the Ministry of Customs and Trade were analyzed to compile the macro data related to carob products in Turkey and the world and a carob value map was created.

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EXECUTIVE SUMMARY

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Carob in Turkey is regarded as an income generator in terms of economy in 6 provinces. Respectively, these provinces are Mersin, Antalya, Adana, Muğla Osmaniye and Burdur. According to fieldworks, Gazipaşa and Gülpınar villages have an appropriate climate for cultivation of carob. Carob has a significant place in forest products and is a common economic activity in these two regions along with animal husbandry.

Carob is a fire-resistant tree and therefore carob is commonly used for forestation in fire-prone areas as a part of combatting against forest fires. Traders of carob in Gazipaşa demand forestation by carob for its both its economic value and for combatting against fire.

Carob production decrease in international markets including Spain creates an opportunity for import. Turkey has been achieving an important position in the market which begun to grow after 2000. Currently, there is not a higher demand for carob in international markets. The share of carob in Turkey in domestic markets is close to the one sold in the foreign market. The quality of the carob affects the unit price.

Carob has a variety of by-products and processed in small amounts with traditional methods. Only, a bigger producer with high production capacity take part in the production process of carob syrup. Standardization problem is encountered in by-products. Traditional picking system with a stick (hitting ripe carobs to fall from branches) damages the branches of the trees, decreasing the productivity in the upcoming years.

Recommendations of this report on the value chain of carbon are as follows:

- Providing import incentives to fill the void left by bigger players in the international market.
- Locally transferring modern carob syrup and grinding technics to increase producers’ profit, decrease logistic expenses and minimizing environmental effects inflicted by logistics.
- Supporting existing channels and opening new channels to ensure the marketing of by-products produced locally in cities.
- Afforesting suitable areas with carob trees for their economic value and fire-reliant characteristic.
- Increasing the number and quality of training provided for villagers and realizing follow-ups of the training on site to raise the quality and productivity of carob trees.
- Vaccinating unvaccinated trees in areas near villages and increasing the number of carobs to be used as dried fruits
- Providing credit and grant aid for entrepreneurs having a potential to increase import and for the facilities producing quality products with high added value.

CAROB INVENTORY

The carob, "Ceratonia siliqua L.", plant is a species of the Caesalpinioideae genus of the Fabaceae family and is also one of the world's oldest trees. Remnants of this plant have also been found among the remains of the Vesuvius Volcano pertaining to 79 B.C. It is a naturally growing maquis plant. The natural growing region of the tree is the east of the Mediterranean Basin and regions with Mediterranean climate and places, which have similar climatic conditions, such as South Africa, Central Chile, and Perth in Western Australia.

In Turkey, carob is also called by different names such as, harnup, harup, boynuz, buynuz, keçibuynuzu and yaban balı. Ceratonia siliqua is used for different purposes and called by their different local names in Anatolia. For example, carob is called "keçiboynuzu" according to the local studies conducted by Gez, S. and Simsek, S. (1999), "Harup ağacı" according to Ertuğ, F. (2004), "Boynuz, Keçiboynuzu" according to Özçelik, H. and Balabanlı, C. (2006), "Boynuz, Keçiboynuzu" according to Bulut, Y. (2006), "Harnup, Keçiboynuzu, Harıp, Harup" according to Gürdal, B. (2010), and "Cırnıp, Harnup" according to Güneş S. (2010). "keçiboynuzu, buynuz ve

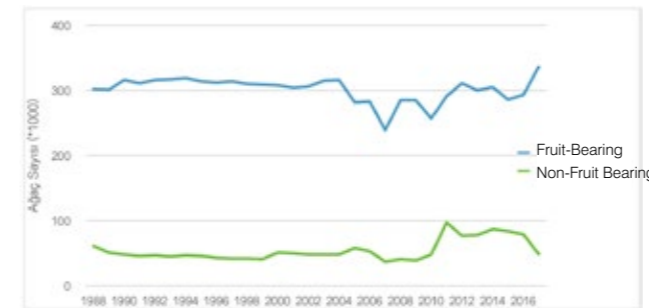
harnup" were used according to the study conducted by Yıldırım and Kargioğlu'nun (2015) in Alanya and Gazipaşa.

Carob is a naturally growing plant species in the Mediterranean Phytogeographical Region. Its distribution in Turkey, which is in its bush form in Izmir starts from the Urla Peninsula and grows throughout the Aegean and Mediterranean coastlines all the way to Erdemli. Carob trees form forests on the south hills of the Toros Mountains. It can also be seen around Hatay. Carob's most widely distributed region is between Antalya-Silifke but it can also be seen in inner Adana, Kozan (See Figure 1).



Figure 1. Natural Distribution of Carob

Carob is a naturally growing species in Turkey, protecting the soil against erosion and resistant to fire and drought. They are distributed among forests either in small groups or individually. According to FAO (Food and Agriculture Organization of the United Nations) data, total number of fruit-bearing and non-fruit bearing carob trees 1988 are given in the graph below (See Graph 1).

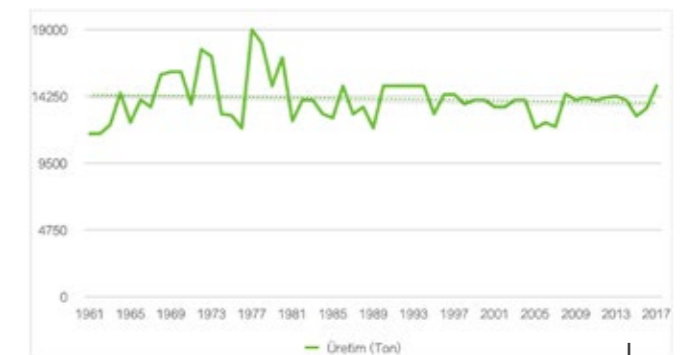


Graph 1. Number of Fruit-Bearing and Non-Fruit Bearing Carob Trees According to Years

The share of fruit-bearing trees within the total number of trees, was 88% between 1999-2009 while in 2011 this figure reduced to the lowest share of 75% and as of 2017 it increased to almost 90%. The total tree numbers has reached its lowest point in 2007 and later it started to rise. This increase can be considered as the result of the 2006-2015 Carob Tree Action Plan implemented by the Ministry of Agriculture and Forestry. Within the Carob Tree Action Plan 14,000 new trees were

planted in Adana, 5,100 in Mersin, 5,000 in Antalya and 700 in Muğla. Moreover, 1,800 carob trees have been planted in Kahramanmaraş within the framework of the Carob Action Plan although the province doesn't have suitable conditions for generating commercial value yet.

70% of carob in Turkey is produced from the wild trees. In 2017, 15,016 tons of products were obtained from 335,687 fruit-bearing trees. Productivity per tree was 45 kg. According to recent situation, the number of carobs included in value chain has started to decline since 2014. Although this trend is parallel to the global decrease, it begins to raise in the following years, increasing in 2016 to 13,405 tons and in 2017 to 15,016. (See Graph 2)



Graph 2. The amount of Carob Fruit included in Carob Value Chain by Years (Tons)

It is difficult to calculate the regional distribution of carob. The sole reason for this is that carob trees do not always form forests in groups and can be sporadically distributed individually. Therefore, it can be seen that carob forests are sparse in Mersin, Tarsus, which is the third region where carob seeds are produced the most. Another reason for this is that

carob plantations in Turkey and modern production areas are very few and the potential is not being utilized.

In Turkey, carob generates an economic income in 6 provinces. These provinces, in terms of their capacity, are Mersin, Antalya, Adana, Muğla and Burdur respectively (See Table 1.).

Table 1. The amount of carob included in value chain in 2017 by provinces

Province	Thousands Tons	Share in Total
Mersin	6,63	44,1%
Antalya	5,21	34,7%
Adana	2,04	13,6%
Muğla	0,92	6,1%
Osmaniye	0,16	1,1%
Burdur	0,06	0,4%
Toplam	15,02	100,0%

Mersin has the highest carob inventory in terms of tons. With its 6,626 tons carobs in 2017 the province produces nearly 50% of carobs included in Turkey's total carob

value chain. Antalya comes as the second province with 5,206 tons and produces 35% of the total carobs alone. Total of Adana, Muğla and Burdur make up 21%.

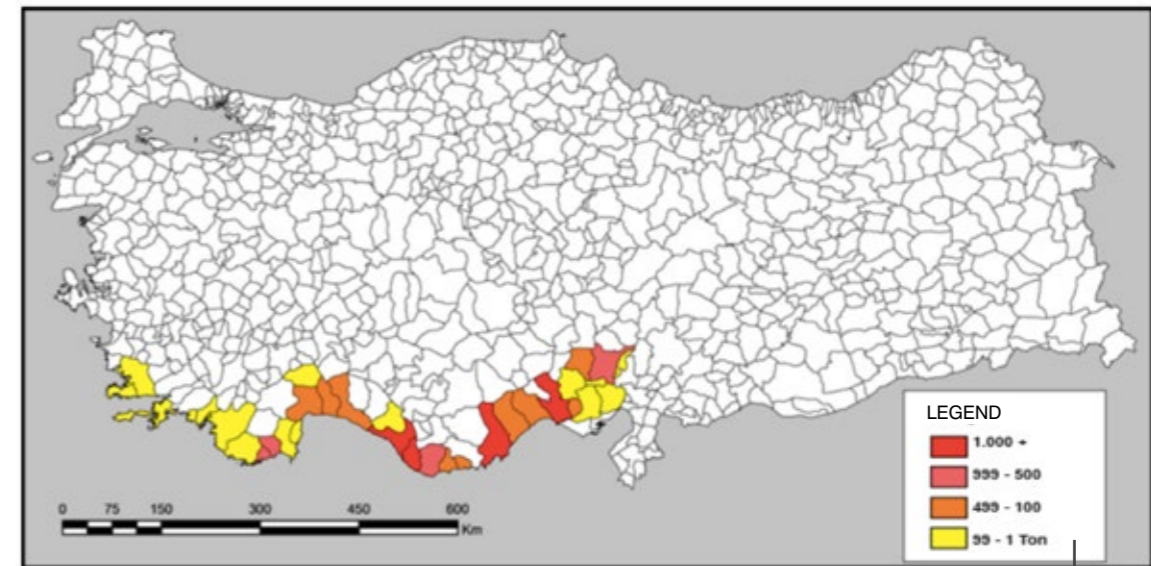


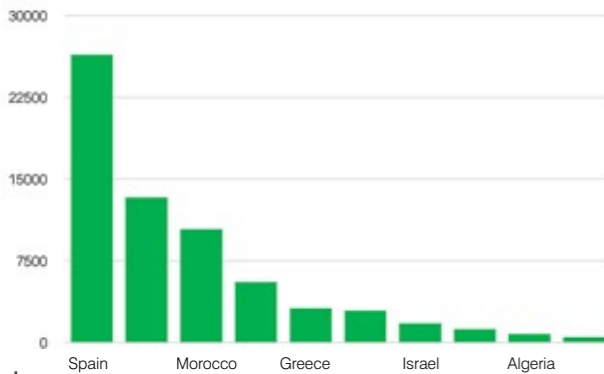
Figure 2. Distribution of carob seed included in value chain of Turkey according to districts

9 districts of Mersin province reap economic benefits from carob. The number of trees in 8 districts of Mersin is over 1,000 and 3 of the districts have more than 10,000 carob trees. Silifke and Tarsus districts of the province have the highest capacity. Carob produce economic benefit in 12 districts of Antalya and the number of

trees in 4 districts is over 10,000. Alanya, Gazipaşa, Demre, and Finike have the highest capacity respectively. Moreover, new carob areas have been established in Sarıçam and İmamoğlu districts (See Figure 2).

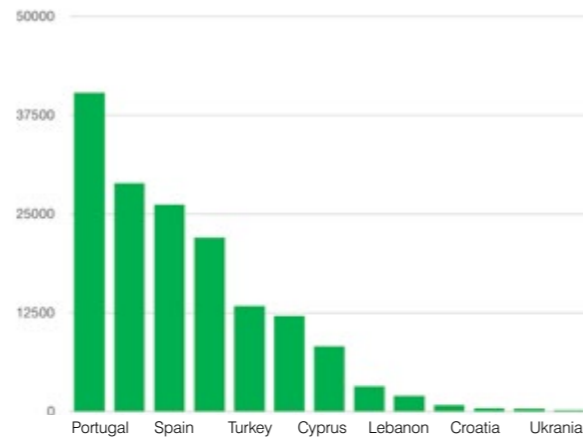
CAROB EXPORT

The carob tree can only grow in Spain, Italy, Morocco, Portugal, Greece, Turkey, Cyprus, Malta, Mexico, Israel, USA, Australia and South Africa. Although Spain was the leading country in carob cultivation in the past, today Portugal and Italy produce more carobs than Spain but Spain has the largest area in terms of carobs followed by, Portugal, Morocco, Italy, Greece and Turkey respectively (See Graph 3).



Graph 3. The Breakdown of Areas Where Carob is Cultivated per Countries as of 2016 (ha)

In the terms of the amount of production, it can be seen that Portugal, Italy, Spain, Morocco and Turkey rank in the top 5. As of 2016, Portugal produced over 40,000 tons, Italy produced 29,000 tons, Spain produced 26,000 tons, Morocco produced 22,000, Turkey produced 13,000 tons and Greece produced 12,000 tons (See Graph 4).

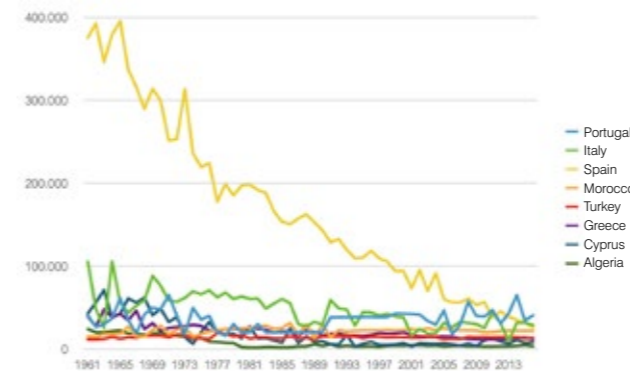


Graph 4. Countries Which Produce the Most Carobs as of 2016 (Tons)

According to the 2016 data of FAO, carob production is declining worldwide. Carob production which was over 370 thousand tons in the 1960's in Spain alone has declined below to 50,000 tons. The main reasons for the global decline in carob production are the mechanization of farming and the drop in prices as well as the development of tourism and settlement areas along coastlines. Farmers' interest in carob in many Mediterranean countries has reduced due to low fruit prices, reduced individual consumption and the use of coastal lands for roads, housing and industrial areas.

As the uses of carob expanded in the second half of 2000's, the demand for carob increased again globally. There are works for establishing small similar plantations in Spain, Italy, Portugal, California and Mexico. Carob orchards are also being established in Mersin Erdemli and Adana Kozan in order to meet foreign demand.

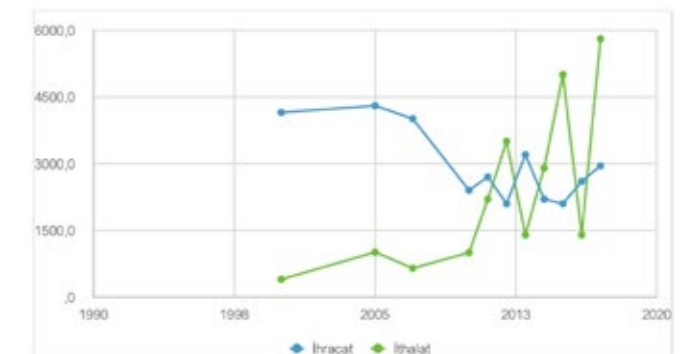
On the other hand, carob production is decreasing around the world according to FAO data. This trend can be seen in the graph provided below (See Graph 5):



Graph 5. Carob Production per Country According to Years (Tons)

Carob imports in Turkey are common but a majority of these imports are exported again. (See Graph 6) Imports are made from Germany, Switzerland, France and the Turkish Republic of Northern Cyprus in the form of syrups made from carob, carob seeds and carobs that have not been peeled or crushed. On the other hand, although carob export does not rank at the top of Turkey's agricultural product exports, it still holds an important place in the terms of global carob exports.

Turkey has increased its carob exports especially since the 1990's. An attention-grabbing issue is that carob exports are being realized in the form of seeds (unpeeled and uncrushed), seedless carobs, seedless and powdered along with whole carobs to EU countries such as Italy, Spain, Germany, England and Greece and to Middle East and African countries such as Saudi Arabia, Morocco and Lebanon. Although it is not recorded in official statistics, findings show that carob syrup is being exported abroad from Antalya.



Graph 6. Imports and Exports According to Years (Tons)

A majority of the global production is being supplied by Portugal, Italy and Spain. Spain has 57.5% of the world's total planted areas. Although carob production

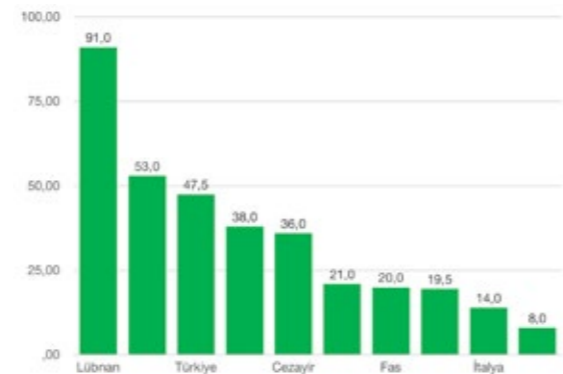
is decreasing worldwide, demand for carob is increasing. Turkey has started to produce near 10% of the global carob production (See Table 2)

CAROB VALUE MAP

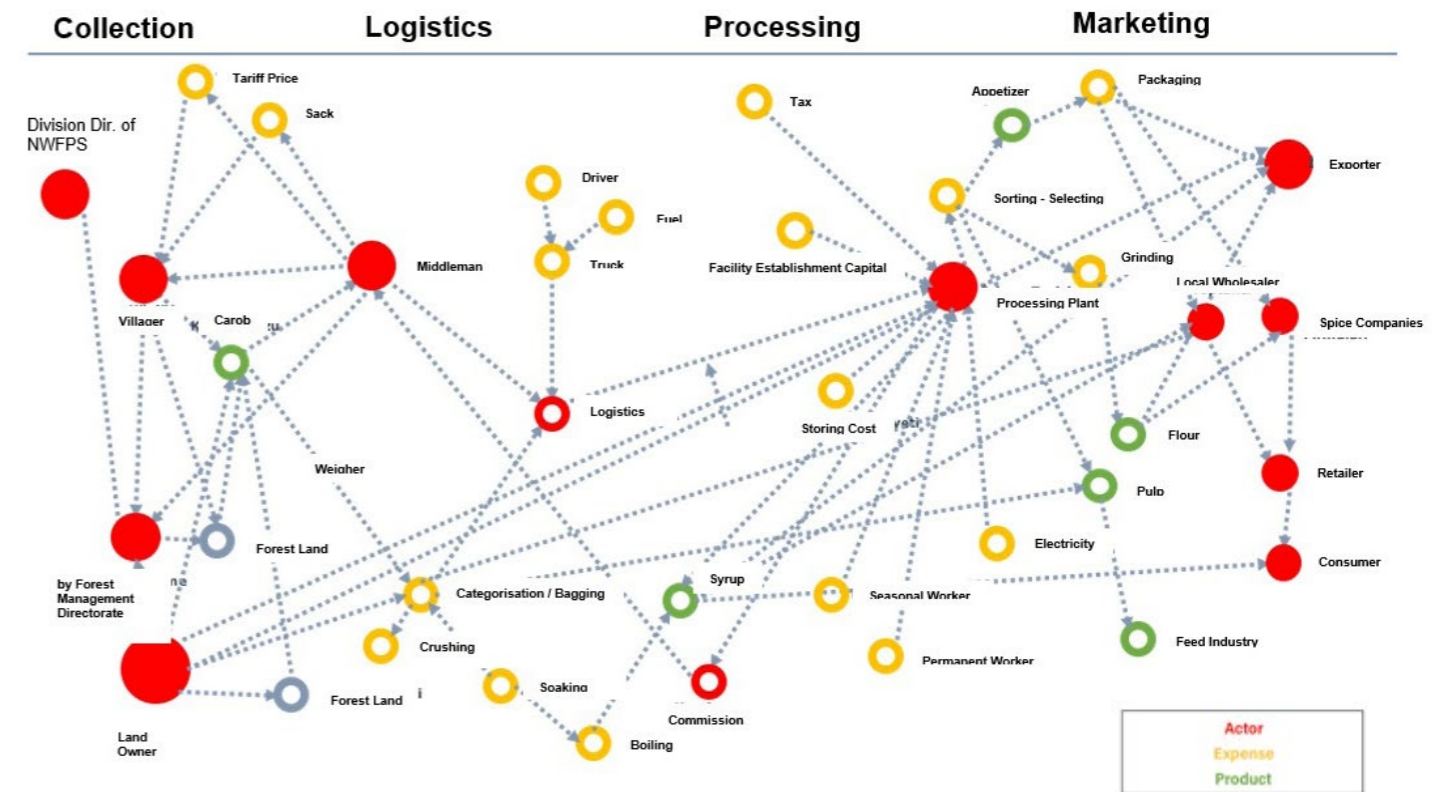
Table 2. Figure. Carob Production in Turkey According To Years Its Share within Global Production

Years	World Total	Turkey Total	Turkey's
1980	362.328	17.000	%4,7
1985	304.204	12.275	%4,0
1990	268.006	15.000	%5,6
1995	240.210	13.000	%5,4
2000	221.495	14.000	%6,3
2005	170.736	12.000	%7,0
2010	170.552	14.172	%8,3
2011	181.171	13.978	%7,7
2012	166.848	14.166	%8,5
2013	145.389	14.261	%9,8

In 2013, Lebanon ranks at the top in terms of carob seeds per tree. Production per tree is 91 kilograms in Lebanon, 53 kilograms in Cyprus and 47.5 kilograms in Turkey. Turkey is followed by Greece and Algeria with 38 and 36 kilograms respectively (See Graph 7).



Graph 7. Carob Seed Production per Tree According to Countries (KG), 2013



MAJOR ACTORS OF CAROB VALUE CHAIN

Regional Directorate of Forest, Non-Wood Products and Services Section:

The exploitation plan that is prepared following the forest management plans by the Regional Directorate of Forest' Non-Wood Products and Services Section is submitted for approval to the General Directorate of Forestry in Ankara.

Forest District Directorate: It is in charge of forest management and implements forest management plans. It has a more direct interaction with villagers. The annual tariffs determined for the relevant year are collected by the Forest District Directorates.

Forest Villagers / Collectors: They play a role in collecting carobs which will be used as dried fruits or seeds. They collect carobs from the areas determined by the by Forest District Directorates. Prior to collection, they pay tariffs to the by Forest District Directorate. They are usually the people with the least gain in the carob collection, processing and export chain.

Trader/Intermediary: Individuals who contact forest villagers for carob collection. They load and transport the products after collection. They may work directly with export companies or may work with facilities for the selection of carobs.

Spice sellers, selection and packaging: They mostly act on the demand of export companies. Facilities can access to carob either through heads of villages or directly

from villagers. Selection of carob is usually easier compared to other forest products. Villagers make the majority of the selection themselves before they sell it.

Syrup producers: Carob syrup is produced both conventionally and industrially. The 5-HMF rate of syrups produced conventionally is high due to duration and temperature.

By-products producers: Carob flour and cookies made of carob flour with sugar and without sugar is produced in Gazipaşa while Turkish delight is produced in Manavgat. Moreover, there are some innovative enterprises producing a spreadable mixture of carob syrup and peanut butter for breakfast.

Locust Bean Gum: Gum is a valuable product produced from carob seeds. Active producers producing gum are found in Gülnar and Gazipaşa.

Exporters: Producers contact traders and drying facilities regarding the related products based on international demand.

Buyer: Actors who are in contact with export companies and demand carob. Mostly EU countries, Arabian countries and USA. Carob which is exported is mostly of high quality and are used as dried fruits.

FROM THE TREE TO THE MARKET: CAROB VALUE CHAIN

Carob Collection Planning and Organization

The carob plant is significantly resistant to drought and has a deep root system (20-25 m). It can therefore bear fruits even in periods of severe droughts. Although an annual precipitation of 500-600 mm on average is ideal in terms of the plant's water needs, it can also tolerate 100 mm of precipitation. As carob's need for sunlight is high, the production depends on the low number of cloudy days. Accordingly, the shortness of rainy days for which it meets its water needs is quite important. Hence, the number of rainy days has been identified as 72.2 days in Mersin, 77.3 days in Antalya, 96.3 days in Muğla and 81.6 days in Adana. In summary, Gazipaşa and Gülnar where fieldworks are conducted are climatically suitable. Carob has an important place in terms of forest products in these two regions and carob production is common economic activity along with animal husbandry.

"Those who have a few carob trees in the village collect and sell them."

Gazipaşa, Villager, Female

Although carob trees are not commonly found in the forest, it is used for afforestation of areas with higher risk of fire as a part of the fight against fire due to its fire-resistant characteristic. Carob traders in Gazipaşa in Gazipaşa demand forestation by carob for its both its economic value and for combatting against fire.

"We want it to be planted in areas that generally catch on fire and damaged areas. Only needle-leaved trees are used for forestation of this region."

Gazipaşa, Processing Facility

CAROB COLLECTION

A majority of the carobs are collected by forest villagers from forest lands and a small portion is collected by land owners of private lands. Although land owners do not need to receive a permit for carob, they still need to file a petition with the by Forest District Directorate of their district stating that they will be collecting carobs. Following the petition, carobs in private lands are recorded by the by Forest District Directorate. The permit of the General Directorate of Forestry is required for state-owned forest lands. The villagers of the village which is closer to the forest land have priority in collecting carobs.

“Forest villagers collect carob. But those who are not forest villagers, grow carobs in their own lands. We give you the total product at the end of the year. Forest villagers collect and pay us the tariffs. After collection, carobs are categorized like any other product. They are categorized according to their quality and are evaluated based on whichever product it appeals to in the sector.”

Gülner, Department of Forestry

The tariff determined by the General Directorate of Forestry for 2017 is 0.06 TL per kilo. In return, villagers collect carobs from the forest lands they benefit from.

“Carob was used irregularly. Later on, certificates started to be used. An organic certificate is required when exporting carobs abroad. After certificate requirements, they started to record products. Previously, carobs were collected but were not recorded. The state has to document what they collect when a certificate is required”.

Antalya, Department of Forestry

Carob collection starts in August and continues until December. Fruits which are not collected in time, either do not completely mature or fall off.

“Carob is collected in mid-august and continues to be collected until December. Thyme collection starts in June and continues until September. Daphne is collected in mid-august and continues to be collected until December.”

Gazipaşa, Middleman

Carob collection in the region is usually realized by climbing trees and hitting the branches with a stick so that matured fruits fall. Although this method requires less effort than collection by cutting, the harm caused to the branches significantly reduces productivity in future years.

“Carobs are collected by people living in the village. An outsider doesn't collect carobs. Sometimes outsiders bring us carobs. Sometimes we go and pick it up from people who don't have cars. Carobs are then separated into sacks. This is effectual for all products.”

Gazipaşa, Facility Owner,

Fallen or collected carobs are placed into sacks. Sometimes before carobs are put into sacks they are separated according to

whether they will be used for feed, syrup making or as dried fruits and once they are categorized they are put into sacks. Carobs which grow especially in coastal areas have black interiors; therefore, these are used as pulp and feed or are sent to facilities for their seeds to be grinded.

“Carobs without honey are usually used as feed. Irrigation and maintenance cause the differentiation in carobs. Grafting is also realized.”

Gazipaşa, Department of Forestry

“Carob matures in summer. In coastal areas, the interior of carobs is black; therefore, they are always sent to the factory. Villagers collect carobs. People collect carobs as they wish and the forestry department is contacted during transportation. A tariff is paid but I don't know how much this is. They send the carobs they collect to the factory with the middlemen. This year they got approximately 3-4 Turkish Liras from villagers but I don't know how much they gave to the trader.”

Gazipaşa, Department of Forestry

The biggest motivation for villagers to collect carobs is the quality of the carobs in their villages. If the villagers' carobs in their orchards or villages are ungrafted or close to coastal areas, the quality of these carobs and the sale price in parallel reduce.

While low-quality carobs which are used as feed are worth 0.80 liras per kilo in 2016, they were sold for 1.30 liras. The price of good-quality carobs can be increased to 7 liras in 2017. When unit prices are high, villagers are motivated to collect carobs.

"As prices are low, people don't collect carobs as much as they used to. They only collect the grafted ones. This groups carobs into first quality and second quality. They give second quality carobs to the factory and first quality carobs for processing as dried fruits."

Gülınar, Department of Forestry

"Those which are plump and with a white interior are used as dried fruits. They grow naturally in this region. There are no chemical fertilizers or residues."

Gazipařa, Head of Village

"They have higher prices if they are to be used as dried fruits. The interiors of carobs in Karaseki, Hasancık, Karadere, Örendüzü are white; therefore, they are sent to be processed as dried fruits. The price of these vary between 3-5 liras per kilo. These are the selected ones. The remaining go to factories. The ones which are 0.30-0.40 liras are the ones with black interiors"

Gülınar, Middleman

"Dried fruit seller says he wants to buy dried carobs. Do you have good carobs that I can display on my stall? he says. I then select the flat and standard ones after collection. I give the bad ones to the factory. Good ones are worth 3-5 liras."

Gazipařa, Middleman

It has also been stated that the carob plant is also suitable for beekeeping during its blooming period and that therefore the carob plant is also demanded by beekeepers.

"The carob plant blossoms before it gives fruits, and during this phase it is a plant which is requested by a lot by beekeepers."

Gazipařa, Department of Forestry

As the sweetness of the carob varies from region to region, plant owners buy carobs from regions with good quality carobs.

"Karalar, Kızılgüney, Yeniköy. We buy products from all over but these three are the regions where we buy carobs the most"

(Male, Facility Owner, Gazipařa).

It is common for villagers in Gazipařa and Gülınar to be in direct contact with spice sellers. It has been observed that intermediaries are not acting actively when it comes to carobs compared to other forest products.

"Sometimes there's a middleman, sometimes there's not. We negotiate. The spice seller can come himself. They come from Aydın and Konya. If they want, they send it through courier. They make their syrup themselves. Sometimes villagers do it for them. Sometimes they sell the syrup they make themselves."

Gülınar, Head of Village

It is common for carobs to be selected and sold directly by the collector. Therefore, initial transportation costs are paid by the collector. Carobs in small amounts are directly transported to spice sellers and processing plants with the collectors' private vehicles.

On the other hand, carob syrup which is a by-product of carob is traditionally produced and consumed in villages. There are local syrup production facilities in Gülınar and Gazipařa but villagers select and spare a portion of what they have collected and then crush and wet them. Usually these carobs are left to boil in vessels which have been placed in collection areas and syrup which will meet their domestic consumption needs is produced.

"They say that approximately 700-800 tons of carobs are being processed in Gazipařa annually. As far as I know this is around 500 tons. The remaining is used by villagers. They give it to traders. Traders process them, categorize them and send them. That product is then processed in other facilities."

Gazipařa, Department of Forestry

Carobs mostly come pre-selected either by middlemen or by producers who collect carobs from their own large lands. Carobs that have not been selected are selected at

THE LOGISTICS OF CAROB AND CAROB

the carob processing facility and are sent to exporters, spice sellers or the feed industry according to their qualities.

"A portion of the carobs is used for cooking. We select those. First quality is for cooking. Second quality carobs become seeds, feed or pulp. We select the ones for cooking and the ones to be used as dried fruits at the facility. We sell the good ones as dried fruits. The remaining become syrup in factories. We send it to Mersin, Malatya, Antalya. Our facility has selection and packaging processes. Carobs to be used as dried fruits are being packaged. We select the good ones."

Gazipařa, Processing Facility

Selection of carobs are easier compared to other products. Because the quality of the tree which provided the carob, the sweetness of the carob is generally known by the villagers. Therefore, an intensive effort to select carobs to be used as dried fruits or for other industries is not required. In terms of processing duration, carobs do not need a lot of processing except for extracting the saps from the fruits. In addition, since drying is not required, the collector can directly put the raw product on the market or process it.

"We are located in a region where there are a lot of carobs. We put the carobs which we take from neighbor villages into washing crates and grind them for an hour after washing them. We then wet them and leave them in the water for twelve hours. Carobs and water are then separated and we send the carobs to vessels. After boiling for approximately seven hours, they turn into syrup. They then cool for twelve hours and are then sent to filling storages."

Gazipaşa, Syrup Producer

Facilities that process carobs also have equipment for by-products that are produced from carobs. For example, facilities that produce syrup have a wetting vessel, a carob crushing machine, boiling vessels, a cooling pool and a bottling machine. Facilities that produce flour on the other hand have washing and grinding machines and packaging machines. Due to low production expenses, carob processing facilities usually act as a bridge between villagers and wholesalers or exporters. In this sense, facilities add a profit to a small processing that they realize on the carobs which they purchase from villagers and put the products on the market.

"We sell the low-quality ones for 0.80 liras. The good ones are sold for 3-4 liras. We buy it for 0.80 liras from the village and add a 10 percent profit and re-sell it."

Gazipaşa, Processing Facility

"We bought 400 tons of carobs collected from the forest. There are those who collect it from their own lands as well. Gazipaşa reaches a minimum of 4,000 tons. We buy 3,000 tons of this."

Gazipaşa, Processing Facility

"We send the ones intended for cooking and dried fruits to Antalya. They package it for us. Carobs for cooking come in separate sacks. And they are collected separately anyway."

Gazipaşa, Processing Facility

Carobs that are processed and packaged are then exported based on the quality that is demanded. Carobs that have high honey rates and which are used as dried fruits are usually sent to Arabian countries and carobs for industrial use are sent to European countries.

CAROBS AND BY-PRODUCTS IN THE MARKET

"We have an exporter company. They send it abroad. They send it to Arabians. They send it to Egypt and Saudi Arabia. People in Mecca and Medinah take these to their homes like date palm. It is consumed a lot there."

Gazipaşa, Processing Facility

"Carobs for cooking get sent all over Turkey. First quality carobs get sent to Istanbul. We send processed carobs to Istanbul. From there, it gets sent all around Turkey. The provinces of Konya and Gaziantep send it abroad."

Gazipaşa, Processing Facility

"Carob gets sent to all Europe. Significant numbers are being sold. They are also sent to Saudi Arabia. We also have carob delight. It is more delicious than carob syrup. 80 percent of carobs are used for syrup making."

İzmir, Exporter

Carob has a wide area of use. Therefore, no matter what the quality of the carob produced is, it always has a buyer in the market. The most expensive carobs which can either be used personally or industrially are the ones that have white interiors and more flesh. These are also used as dried fruits.

"Carobs are never wasted. If people don't eat them, animals will."

Gülınar, Head of Village

Carob which was also called St. John's Bread in English due to its rich nutritional value is usually used as dried fruits, flour and animal feed in Turkey. For the past two decades carobs were generally consumed in the regions where they were produced but now carobs are being processed as syrup and flour and consumed all around the country. In Turkey, the financial income of the carob fruit is more than its wood. Therefore, this by-product which we call carob is more valuable compared to the main product which is wood.

Carob fruits take an important place in Turkey's forestry by-product exports and have various uses. Among the top industrial uses are food industry, textile, paper and petrol industries. In the food industry, the paste and resin of carobs and their derivatives are used as raising agents and are also used in dessert and ice-cream production. They are also used as preservatives in meat products such as salami and as stabilizer in meat and fish products, sauces, jellies, syrups and fruit concentrates and as anti-staling agent in cakes, pies and similar bakery products. Finally, it is also used to replace eggs in ready-made cakes and biscuits and provide a consistency that prevents disintegration. Carobs can substitute in areas in which cacao and coffee are used. Flour can also be obtained from carobs.

"Carobs can be used as syrup or as coffee. Their seeds are used. They are used to grow saplings. The saying "spick and span" comes from the carob seed. Healthy carob seeds all weigh the same. Their seeds are used in measurements. It is a very special product."

Gazipaşa, Department of Forestry

Due to its natural sugar content, its low calorie, being cholesterol free and affordable, it is used in the cake and cacao industry. Carob fruit contains more sugar than sugar cane. 52% of a carob without

its seed is sugar. Therefore, it is used as a product in facilities that manufacture syrup and canned goods. Additionally, it can be used by gluten-free food producers as carob does not contain gluten.

"Many different products are manufactured using carobs. The people of Gazipaşa are entrepreneurs and they can make new things. Carob has coffee, syrup, juice and this can be drunk without having to turn it into syrup. It can also be consumed as food. The carob fruit is delicious to eat. Not everyone may drink its syrup but everyone can eat its fruit. I witnessed this. I also know that the carob seed is used as an alternative to salep. Especially in ice-cream production. Apparently, they use carob seeds when they don't have salep."

Gazipaşa, Department of Forestry

"I produce the flour in three different types depending on its usage area. I grind them especially small when they are used in cakes and cookies. Moreover, since it does not contain gluten, it is a good alternative for cookies, particularly."

Gazipaşa, Processing Facility

The E-410 preservative can be produced from the endosperm of its seed and this preservative is used for different purposes in industries such as food, cosmetics and textiles etc.. In the textile industry the paste of carobs and their derivatives are used in cotton weaving, in all types of dyeing and prints due to its alkali resistance and as density increaser and as a facilitator for fabrics to absorb dye. In the paper industry, carob paste prevents time and energy loss when casting paper.

In the petrol industries, carob paste is used as an effective preservative in drilling operations and to control water loss and decrease of mud density in the drilling of deep salt layers or when working in salty water.

Apart from all these uses, carob is also used in printing, in the cosmetics industry as dye, in match production, furniture, leather (tanning), in the emulsion of photographic films, in the detergent and plastic industry, in the tobacco industry to give taste to cigarettes, in explosives, in the ceramics industry as glue, in toothpaste manufacturing as concentrator and as feed in animal breeding.

"They say it is used in lipstick and syrup production. The rest is used as feed."

Gülınar, Department of Forestry

Studies also revealed that local people collecting carobs also use carob syrup and carob for medical purposes. Local people use the natural syrup obtained from the plant's fruits in food, dye, as feed for animals and for medical purposes (as hematinic, for coughs, as sperm increaser, for diabetes, for gall bladder diseases). Carob's use for medical purposes was more prevalent in other studies conducted in regions close to this carob research area.

"The carobs of our regions may be sold under the name 'Anamur carob', we don't know that. There are carob extracts in pharmacies. It's more concentrated than syrup. They do it like paste. For example, its tea is delicious. Someone was mentioning it the other day. You add seven carobs in one liter of water. It opens up the lungs. You can drink it day and night."

Antalya, Regional Directorate of Forestry

Studies conducted on carob show that syrup production in particular is a field where women's labor is more dominant.

FACTORS IMPACTING THE QUALITY OF CAROB

Interior Color: Carobs with white interiors are used as dried fruits while the others are used in powder, pulp and syrup manufacturing by grinding their seeds. Good quality carobs which are used as dried fruits change hands between the villager and the spice seller with a 500% higher price. The sweetness of carobs collected from the areas 300 meters below sea level is low and its interior color is dark while the carobs collected 450 meters above produce better quality fruits.

Flesh ratio and sweetness: Carobs with higher flesh ratio find buyers for personal consumption under higher prices in the market.

Pests and defects: Some carob trees can be infested by pests. Pests cause fruits to develop defects, reducing its quality.

Temperature in syrup production: Heating sweet products under especially high temperatures increases the formation of 5-HMF causing the product to lose its quality. In Turkey, high temperature is applied in additional traction in carob syrup produced using conventional methods.

Extraction duration in syrup production: Factors such as extraction temperature and duration, which are directly related with product quality, are not being taken into account in syrup making from carob fruits, in conventional methods.



MAIN CHALLENGES IN CAROB VALUE CHAIN

- Countries such as Spain reducing their production creates export opportunities in the international market. Turkey is earning an important position in the market which has started to grow after 2000's.
- There still isn't a high carob demand at the international level. The rate of carobs collected in Turkey in the domestic market is close to the rate sold to foreign markets.
- The quality of carob affects the unit price.
- Carob which is rich in terms of its by-products are processed in small amounts

with conventional methods. Only its syrup has large producers.

- Carob, rich in by-products, is processed in small amounts by traditional methods. Producer with higher production capacity only plays a role in the production of carob syrup.
- Standardization problem stands out in by-products.
- Conventional carob collection using sticks (hitting the tree to drop matured carobs) harms the tree thus reducing its quality.

RECOMMENDATIONS ON CAROB VALUE CHAIN

- Providing export incentives to fill the gap large players leave in the international market.
- Transferring modern syrup and grinding techniques to the local level in order to increase the producer's profit, reduce logistic expenses and decrease the environmental impacts of logistics.
- Opening channels in order to market locally produced goods in urban areas and supporting existing channels.

- Increasing the number of training provided to villagers in order to increase the quality and productivity of carobs and developing the content of the training and following it up in the field.
- Vaccinating unvaccinated trees near villages and increasing dried fruit production.
- Providing grants / loans to facilities which will deliver value-added, good quality products and initiatives which have the potential of increasing exports.

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NON-WOOD
FOREST
PRODUCTS

CAROB
VALUE CHAIN ANALYSIS

