REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY

Mevlana
Kalkınma Ajansı
Development Agency
www.mevka.org.tr

Konya Province
Gelatin Production
Pre-Feasibility Report

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Konya Province Gelatin Production

Pre-Feasibility Report

2020
NOVEMBER

SCOPE OF THE REPORT

This pre-feasibility report has been prepared by the Mevlana Development Agency, which operates under the coordination of the Ministry of Industry and Technology, to determine the appropriateness of the establishment of a gelatin production facility in Konya, to inform investors, to offer investment ideas for investors and to provide a basis for detailed feasibility studies.

RIGHTS STATEMENT

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ABBREVIATIONS

ABIGEM	***European Union Business Development Centers***
CUR	***Capacity Uilization Rate***
CTSP	***Customs Tariff Statistics Position***
E-TUYS	***Electronic Incentive Application System***
EIA	***Environmental Impact Assessment***
GME	***Gelatine Manufacturers of Europe***
HACCP	***Hazard Analysis and Critical Control Points***
ISIC	***International Standard Industrial Classification of All Economic Activities***
ISO	***International Organization for Standardization***
ITC	***The International Trade Centre***
IZ	***Industry Zone***
MEVKA	***Mevlana Development Agency***
NACE	Nomenclature des Activités Économiques dans la Communauté Européenne
OIZ	***Organized Industrial Zone***
R&D	***Research and Development***
SEDR	***Socio-Economic Development Ranking***
TOBB	***Union of Chambers and Commodity Exchanges of Turkey***
TSI	***Turkish Standards Institute***
TURKSTAT	***Turkish Statistical Institution***

KONYA PROVINCE FOOD SECTOR GELATINE PRODUCTION PRE-FEASIBILITY REPORT

1. INVESTMENT INFORMATION

Subject of the Project	***Gelatin Production Facility***	
Information about the Product/Service	***Gelatin***	
Investment Location (Province-District)	***Konya***	
Technical Capacity of the Facility	***Production Of 1,500 Tons / Year Standard Powder Gelatine From Bovine Bone***	
Fixed Investment Cost (USD)	***18,020,460 ($)***	
Investment Period	***15 Months***	
Economic Capacity Utilization Rate of the Sector	***N/A***	
Employment Capacity	***153***	
Payback Period of Investment	***4 Years 10 Months***	
NACE Code of the Product/Service (Rev.3)	***20.59 Manufacture of Chemical Products***	
Harmonized Code (HS) of the Product/Service	***35.03 Gelatin, gelatin derivatives, fish glue, animal glues***	
Target Country of Investment	***Turkey***	
Impact of the Investment on Sustainable Development Goals	***Direct Effect***	***Indirect Effect***
	Goal 9: Industry, Innovation and Infrastructure ***Goal 12: Responsible Consumption and Production***	***Goal 3: Good Health and Well Being***
Other Related Issues	***Planning to manufacture Halal Certificated products***	

Report date: 31/08/2020

2. ECONOMIC ANALYSIS

1.1. Sector Desciption

Gelatin is produced by subjecting the skin, bone and connective tissues of animals such as pigs, cattle and very few fishes to certain production processes. The basic raw material of the gelatin planned to be produced in the facility subject to feasibility is animal bovine bones. Gelatin is a protein substance found in the tissues of mammals, in the parts binding muscles to bones, bones to each other and other organs, and skin, and is extracted from collagen, a protein. When boiled with water, collagen in the skin, bones and connective tissues of animals (mostly cattle and pigs) turns into a water-soluble protein known as gelatin. When cooled, the solution does not turn into collagen; but it turns into a gel. Gelatin is used in many sectors due to its properties such as strong shaping ability, transparent gel forming, flexible film, easy to digest, melting in hot water and easy to shape; it is used in many areas especially in food production.

Activity classifications are classifications that divide the data about all statistical units operating in the economic field into homogeneous categories and present them, determine the main activities of the units and provide international comparison. ISIC (International Standard Industrial Classification) is the classification of economic activities prepared by the United Nations Statistics Office and recommended to be used all over the world. According to ISIC Revised 3.1 classification; detailed codes for gelatin and related products are given below:

Table 1. ISIC Revised 3.1 Code List

Code	Defination
24.29	Manufacture of Chemical Products Not Otherwise Classified
24.29.2	Glue and Gelatin Manufacturing
24.29.2.01	Glue and Gelatins
24.29.2.01.30	Gelatin and Gelatin Derivatives (except casein glues)
24.29.2.01.33	Gelatin and Gelatin Derivatives-Used for Food
24.29.2.01.35	Gelatin and Gelatin Derivatives-Pharmaceuticals
24.29.2.01.37	Gelatin and Gelatin Derivatives-Used forTechnical
24.29.2.01.50	Bone Glues and other gelatins

NACE (Nomenclature Generale des Activities Economiques dans les Communautes Europennes) is the economic activity classification derived from the ISIC classification by the European Union countries and used by the member countries. In NACE Rev 2 of the Statistical Classification of Economic Activities in the European Community started to be implemented by Turkey Statistical Institute (TUIK) as of the beginning of 2008, gelatin production is classified in the Manufacture section (C), Section of Manufacture Chemicals and Chemical products (20), Manufacture of Other Chemical Products (205),

under Manufacture of Other Chemical Products Not Elsewhere Classified (2059), and Manufacture of Gelatin and Gelatin Derivatives and Dairy Albumin (205911).

Customs Tariff Statistics Position (CTSP) codes for gelatin are given below.

Table 2. CTSP List

Code	Defination
VI	Chemical Industry and Related Industry Products
35	Albinoid substances, glues, enzymes
3503	Gelatin, gelatin derivatives, fish glue, animal glues
350300	Gelatin, gelatin derivatives, fish glue, animal glues
35030010	Gelatin and Gelatin Derivatives
350300101000	Gelatin
350300102000	Gelatin Derivatives

1.2. Supports for the Sector

One of the incentives used in promoting investments in a country is investment incentive measures. Incentives are financial or non-financial support and assistance mechanisms that aim to increase production and employment by increasing investments. Investment incentives are frequently used by governments to ensure the development of sectors, especially in less developed regions.

The process of benefiting from the incentives quickly and effectively starts at the application stage, and it is of great importance to reduce bureaucracy. In order to achieve this, some chambers of industry and development agencies have been authorized for incentives, with some exceptions. In addition, with the Authorization Communiqué published in the Official Gazette dated May 31, 2018, Investment ***Incentive Certificate applications and related transactions to be made as of July 2, 2018 have been transferred to the electronic media. The applications to be made after this date and the transactions regarding the incentive certificates to be issued will be carried out electronically. Investment Incentive Certificate applications will be made to the Ministry of Industry and Technology via E-TUYS (Electronic Incentive Application and Foreign Capital Information System) as of this date, and the option of applying to local units where the investment will be made in the pre-regulation Decision is thus eliminated.***

In order to implement the investment incentive program prepared in 2012, regions were classified into 81 provinces and 6 regions, taking into account their socio-economic development levelsn(Socio-Economic Development Index - SEGE 2011). In the new application, the provincial regional incentive system has been introduced instead of the regional system, and Konya has been included in the 2nd

Region. As the level increase, the amount of incentives increase for fostering investments in relatively less developed regions.

This investment to be made in Konya will benefit from general and regional incentive system; the investment topics that will benefit from regional aids have been determined taking into account the investment potential and the competitive power of each province group and have been shown in the list given in the second annex to the Decision on State Aids in Investments number 2012/3305 published in the Official Gazette dated 19.06.2012, numbered 28328.

Gelatin production is included in the manufacture of chemicals and products (24) according to the National Activity and Product Classification. The minimum fixed investment amount for the manufacture of chemicals and products is 3 million Turkish Liras for the 2nd Region, where Konya is also located.

Gelatin production facility investments are considered as "mid-high tech investment" and can ***benefit from 4th region incentives even though Konya is a 2nd region province. This investment can benefit from customs tax exemption, VAT (value added tax) exemption, 45% or 55% indirect investment contribution, 100% tax reduction, the support of employer's national insurance contrinution share and investment place allocation.***

Table 3. Available Investment Support Elements

Incentives			*Konya*
Customs Duty Exemption			*Available*
VAT Exemption			*Available*
Tax Reduction	*Contribution Rate to Investment*	*OIZ and Out of IZ*	*30/45**
		In OIZ and IZ	*40/55**
Insurance Premium Employer's Share Support	*Support Duration*	*Out of OIZ and IZ*	*6 years*
		In OIZ and IZ	*7 years*
Investment Place Allocation			*Available*
Interest or Dividend Support	*Domestic Loan*		*4 points*
	Foreign Currency / Foreign Currency Indexed Loan		*1 points*

(*) High tech products

Within the framework of incentive system, certificates issued for the manufacturing industry (US-97 Code: 15-37), the investment contribution rate for investment expenditures to be realized between 1/1/2020 and 31/12/2022 is applied without any action on the incentive certificate, adding 15 points to the investment contribution rate valid in each region, corporate tax or income tax deduction being 100% in all and the investment contribution amount to be applied to the investor's earnings from other investments during the investment period being 100% (Official Gazette dated 30.12.2019, numbered 30994).

1.3. Sector Profile

1.3.1. Description of Goods

Gelatin is a protein produced by the partial hydrolysis of collagen commercially extracted from bovine skin and bones, pork and fish skins under controlled conditions.[1]

Gelatin is offered for sale in five basic categories: edible, pharmaceutical, technical, photographic and hydrolyzed categories, according to the characteristics of the final product. The majority of gelatin products are edible and of pharmaceutical nature. Commercially produced edible gelatin consists of 84-90% protein, 8-12% water and 2-4% mineral salts, and 100 grams have a nutritional value of approximately 350-400 kcal.

Gelatin is classified as Type A and Type B in terms of its production method. Type A gelatin is produced by treating cattle, pig and fish skins with acid before extraction. In Type B gelatin, bovine bones and skins are pre-treated with alkali before extraction. Type B gelatin will be produced using cattle bones and alkaline pre-treatment.

The list of laws, regulations and communiqués related to agriculture and livestock to which the gelatin sector is directly related are presented in the table below.

***Table 4. Some Laws, Regulations and* Communiqués**

Law no. 5179	***Law on the amendment and adoption of the Decree Law on the production, consumption and supervision of food***	***05.06.2004 OG No: 25483***
Regulation	***Food Hygiene Regulation***	***17.12.2011 OG No: 28145***
Meat Products* Comminiqué*: 2018/52	***Turkish Food Codex Meat, Prepared Meat Mixtures and Meat*** Products Communiqué	***29.01.2019 OG No: 30670***
Product Safety And Control: 2020/5	***Notification of Import Control of Products Subject to the Control of the Ministry of Agriculture and Forestry***	***27.12.2019 OG No: 30991***

1.3.2. Usage Areas

Gelatine is an important industrial additive widely used in the food, cosmetic, pharmaceutical, photography and paint industries. Gelatin is mainly used as an adhesive, thickener, antifoam and emulsifier.

1 Gelatin as a Food Additive: Structure, Properties, Production, Use and Quality / Yüzüncü Yıl University, Department of Food Engineering

Table 5.Industrial Products Using Gelatin and Usage Purpose

Product Used in	*Purpose*
Sweets and Confectionery	Gives flexibility, improves chewing properties, extends the shelf life.
Dairy products	Gives flexibility, increases consistency, improves the structural properties.
Bakery and Pastry Products	Preserves the structure of the filling material, improves the emulsion properties. Protects from the damages of the freezing process.
Meat, Fish and Sausage	It is used as an edible protective coating, improves the appearance. Extends shelf life
Pharmaceutical Capsules and Tablets	It is an essential component of hard and soft capsules. It protects the medicine from the harmful effects of oxygen and light.
Vitamin Products	It protects vitamins from the harmful effects of oxygen and light. Extends shelf life.
Photo Products	It takes part in the development of the movie. Used for graphic film and color photo paper, makes the colors come out bright.
Juice	It is used for precipitation. It plays a role in the formation of a homogeneous and transparent structure.
Match	It is used to hold the match ends to the wooden handle.
Paper and Book	Used for repairing books. It is used to increase the water resistance of paper products. It is used to give strength and hardness to paper.
Chemical Products	It is used in the production of high purity materials.

Source: Gelatin as a Food Additive: Structure, Properties, Production, Use and Quality / Yüzüncü Yıl ***University, Department of Food Engineering***

Gelatin is generally used as a stabilizer or gelling agent in foods. Enriching foods in terms of protein and reducing the ratio of fat and carbohydrates are also among the areas of use of gelatin. Gelatin undertakes various functions depending on the product produced. For example, it s used as a gelling agent in jelly desserts, meats, confectionery and meat sauces; as a structuring agent in Turkish delights, nougat, creams, soufflés; as a binding agent in roll meats, canned meats, cheeses and dairy ***products. Similarly, it is used in confectionery, ice cream, frozen products and frozen desserts to preserve the colloidal structure; it is used as a clarifying agent in fruit juices, as a stabilizer in powdered drinks, broths, sauces, soups, puddings, jellies, syrups and dairy products. It is also used as an emulsifier in soups, sauces, sweeteners, meat and dairy products; as a stabilizer in cream cheese,***

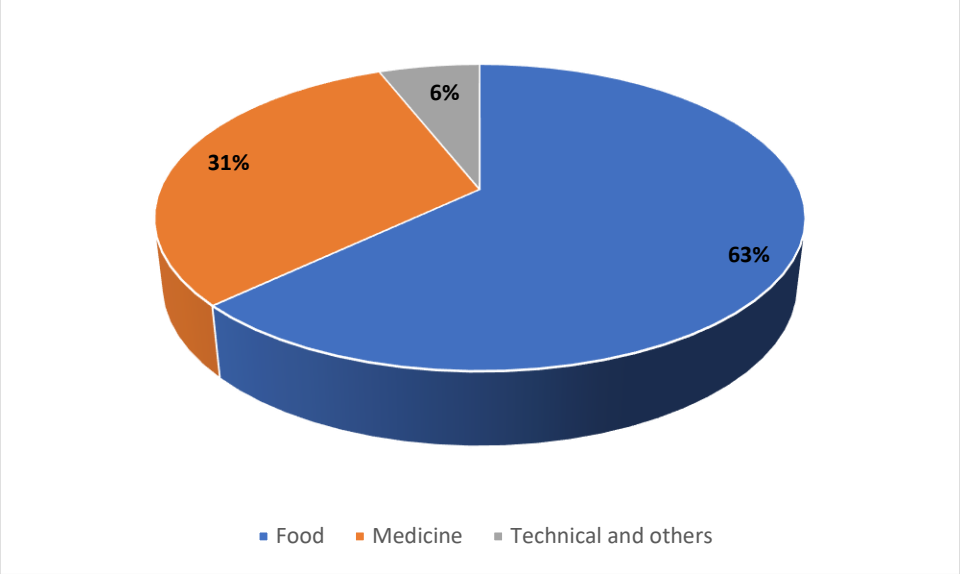
yoghurt and frozen products; as a sticking agent in confectionery and meat products; in confectionery, creams and ice cream to provide foaming; as a crystallization regulator in ice creams, ice products and frozen desserts. On the other hand, gelatin hydrolysates are used in the clarification of beer, wine and fruit juices as well as adding to foods.

Modern silver bromide materials used in photography are produced from emulsions containing gelatin. It works as a support material for the gelatin film layer in these emulsions. Gelatin, which started to be used in the photography industry about a century ago, has recently been demanded for the production of X-ray films.

Gelatin is widely used in serums (as a plasma substitute), hard and soft capsules, vitamin coating materials, drops, tablets, in droplets production, paste coatings, toothpaste production, in microorganism cultures as a nutrient medium, in the production of sponges and formulations of newly developed vaccines.

Bovine, porcine and fish origin collagen and gelatins are products that are used in hair and skin care products and perform important functions. For example, gelatin hydrolysates are added to skin care kits to increase water binding capacity, reduce trans-epidermal water loss and heal skin.

Figure 1. Distribution of Gelatin According to Usage Areas



Source: Gelatin Manufacturers of Europe

1.3.3. Current Situation of Turkey Gelatin Sector

Gelatin production in Turkey is performed by four companies namely Balıkesir ***(Sel Sanayi* Ürünleri Ticaret ve Pazarlama A.Ş. - *SelJel), Bursa (Bursa* Gelatin Gıda San.ve Tic. A.Ş.),** İstanbul **(Halavet Gıda Sanayi ve Ticaret A.Ş.) *and Kocaeli* (BB Tarım Gıda Mühendislik AR-*GE Sanayi ve* Ticaret Ltd.Şti.), *and according to TOBB Database, the total production capacity of these companies is 9,861,600 kg. These companies use cowhide as a raw material in the production of food gelatin.***

Turkey's first manufacturer of gelatin SelJel Sanayi has been established as a manufacturer of glue/technical gelatin from cowhide in Balikesir in 1961. In 2010, Sel Sanayi started to produce halal food gelatin from cattle hides under the Seljel brand.

Bursa Gelatin Gıda, which operates in the province of Bursa, started gelatin production in 2019 ***based on its experience in the leather sector. Halal edible cattle gelatin is produced in the facility established on an area of 20,000 m².***

The other gelatin producers are Halavet company operating in Istanbul and BB Tarım Gıda Mühendislik company operating in Kocaeli.

Turkey Statistical Institute (TSI) does not disclose the information regarding the sectors with a low number of producers within the framework of the Confidentiality Principle, and the producers in the sector do not share information about their installed capacities on company basis for various reasons. For this reason, the table below shows the total production capacity of the companies.

Table 6. Turkey Gelatin Production Capacity

Province	*Registered Producer*	*Staff*						*Producton Capacity*
		E	*T*	*C*	*W*	*A*	*Total*	*KG*
Balıkesir	*1*	*5*	*8*	*6*	*159*	*24*	*202*	*
Bursa	*1*	*2*	*2*	*1*	*49*	*7*	*61*	*
İstanbul	*1*	*7*	*12*	*7*	*50*	*7*	*83*	*
Kocaeli	*1*	*3*	*1*	*0*	*4*	*0*	*8*	*
Total	*4*	*17*	*23*	*14*	*262*	*38*	*354*	*9,861,600*

E: Engineer; T: Teknician; C: Craftsman; W: Worker; A: Administrative staff;
**** If the number of registered producers is 4 or less, production capacity information is not provided.***

Source: TOBB Industry Database, Access Date August 2020

According to the news of Anadolu Agency, a 6,000 tons capacity leather gelatin processing facility is being established in Bolu. It is understood that the facility was established in Bolu in order to benefit

from Leather Specialized OIZ and in terms of proximity to raw material supply, and the capacity is kept higher as it is planned to switch to collagen production at the next stage[2].

1.3.4. Current Situation of World Gelatin Sector

Gelatin is a product which has been produced for years across the world by numerous countries. World gelatin production is made by a few firms and they share the global market.

Figure 2. World Gelatin Import Map

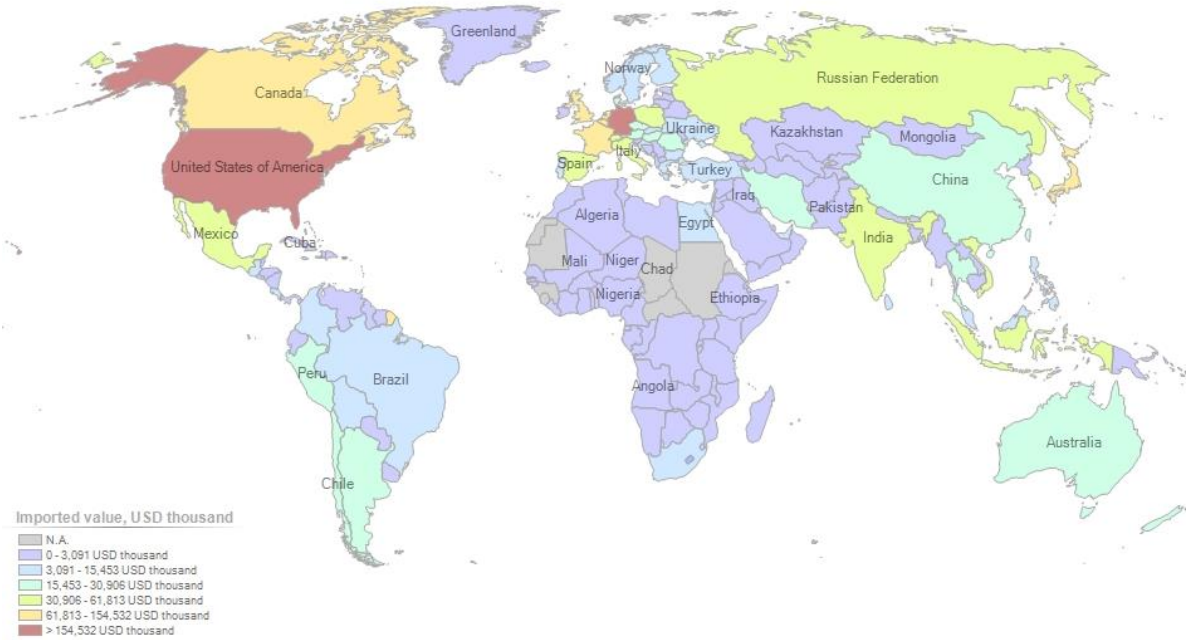
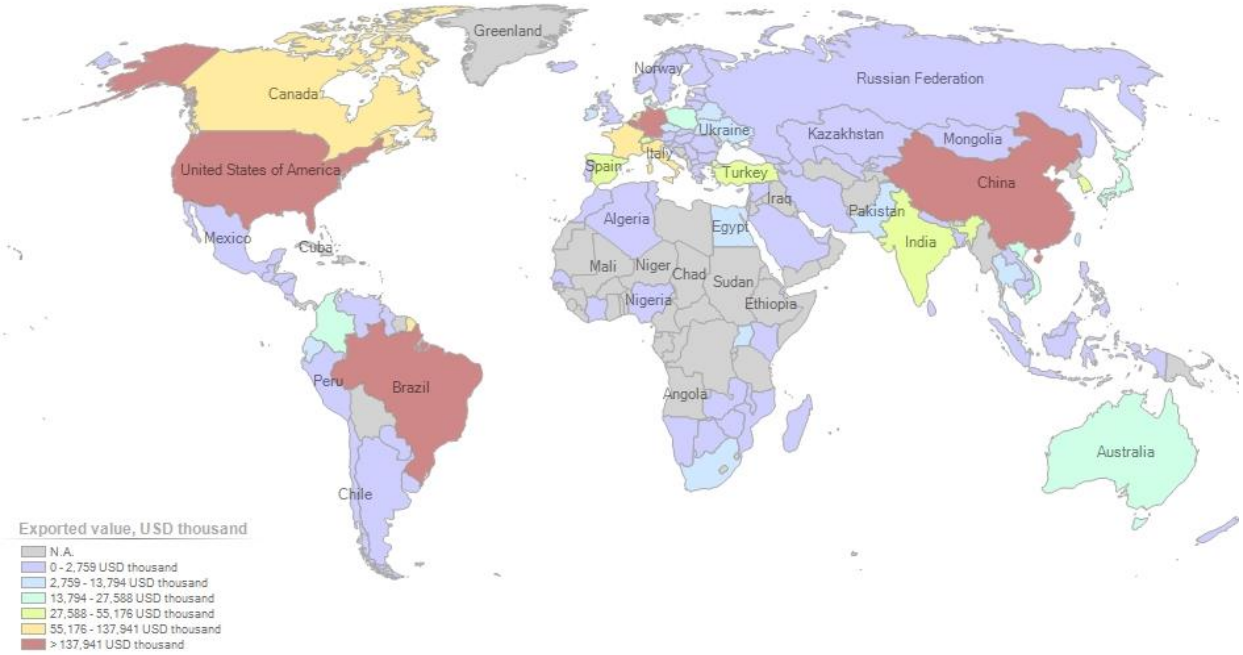


Figure 3: World Gelatin Export Map

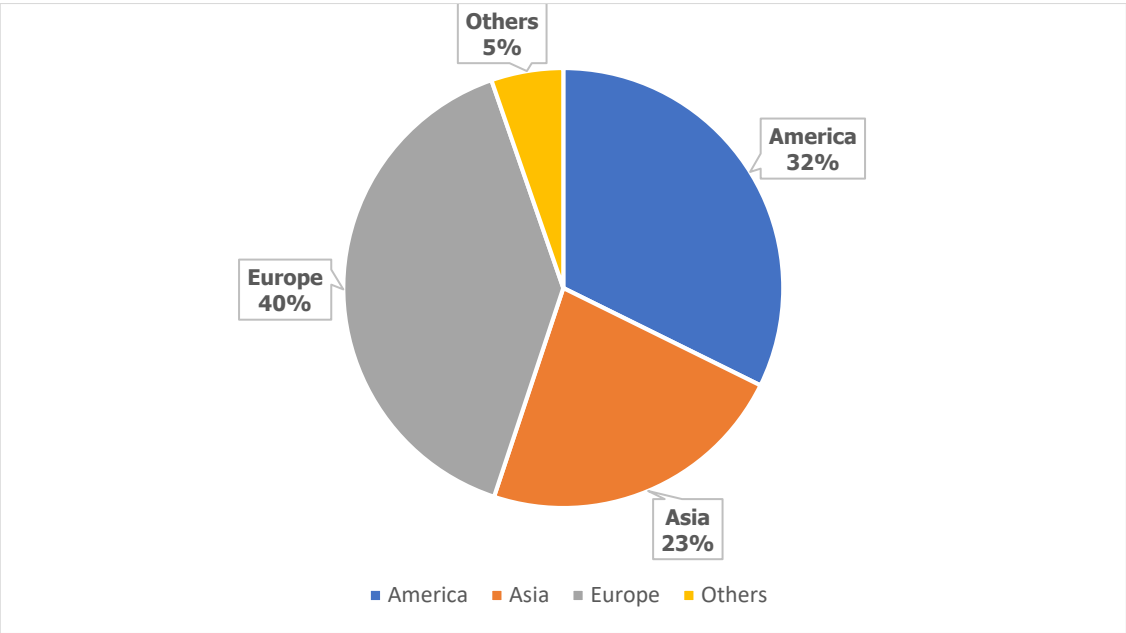


[2] *https://www.aa.com.tr/tr/turkiye/boluda-helal-jelatin-uretimi-icin-fabrika-kuruluyor/1989103*

According to the Grand View Research Gelatin Sector 2019 report, as of 2019, the global gelatin market is 625.5 thousand tons and according to ITC data, the world gelatin trade volume is 3.5 billion dollars. The volume of the sector is expected to reach 915.9 thousand tons in 2027. [3]

Approximately 40% of the world gelatin market is concentrated in Europe and 32% in America. Europe is the world's largest producer and consumer.

Figure 4. Geographical Distribution in Gelatin Production



Source: Gelatin Manufacturers of Europe

Table 7. Prominent Companies in the Gelatin Sector

Name of the Company	*Country*	*Web Page*
Rousselot Gelatin	*France*	*https://www.rousselot.com/*
Gelita	*Germany*	*https://www.gelita.com/en*
PB Leiner	*Belgium*	*https://www.pbleiner.com/en*
Sterling Gelatin	*India*	*https://www.sterlinggelatin.com/*
Nitta Gelatin	*United States*	*http://nitta-gelatin.com/*
Weishardt	*France*	*https://www.weishardt.com/*
Jellice	*The Netherlands*	*http://jellice.eu/*
Lapi Gelatine	İtaly	*http://www.lapigelatine.com/*
Ewald Gelatine	*Germany*	*https://ewaldgelatine.de/english/index.php*
Junca Gelatines	*Spain*	*http://www.gelatinesjunca.com/*
Geltech	*South Korea*	*http://www.geltech.co.kr/*
Gelco International	*Brasil*	*https://www.gelcointernational.com/en/*

[3] https://www.grandviewresearch.com/industry-analysis/gelatin-market-analysis

Some of the leading gelatin producers, members of the institutions that operate worldwide in order to raise awareness about the benefits of gelatin and collagen, to strengthen global dialogue with producers and to establish safe product standards, are given below.

Table 8. Institutions Related to the Gelatin Sector

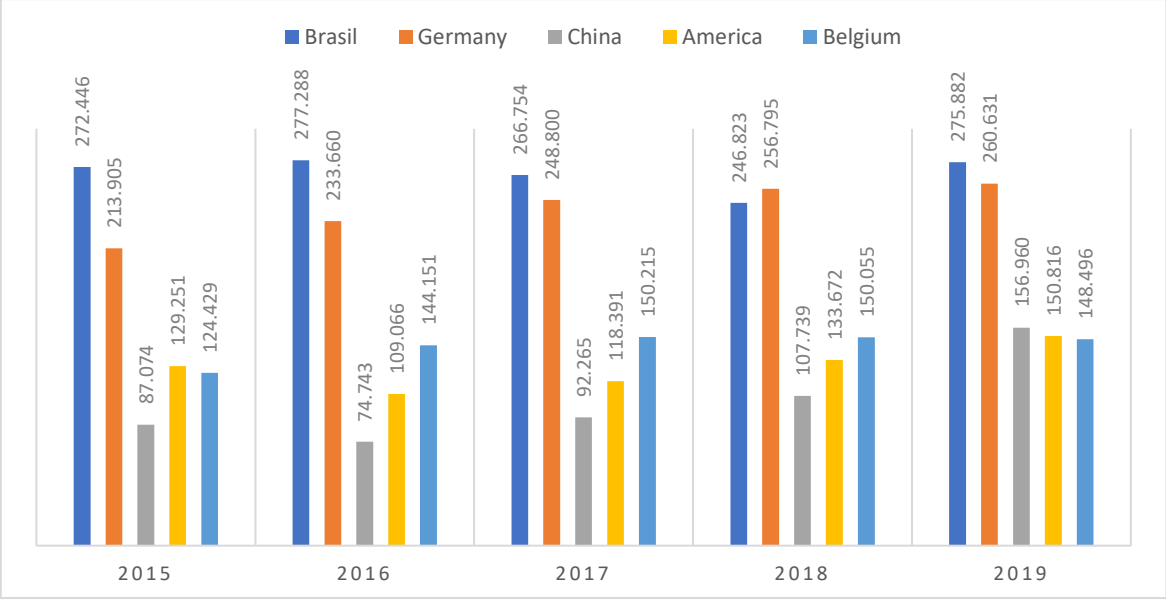
Name of the Company	*Country*	*Web Page*
Gelatine Manufacturers Europe (GME)	*Belgium*	*https://www.gelatine.org/en/*
Association of Gelatin Manufacturers From South America (SAGMA)	*South America*	*https://www.sagmagelatina.com/*
Gelatin Manufacturers Institute of America (GMIA)	*United States*	*http://www.gelatin-gmia.com/*
The Gelatin Manufacturers Association of Asia Pacific (GMAP)	*Japan*	*https://gmap-gelatin.com/*

1.4. Foreign Trade

When the world export and import volume is analyzed according to the ITC data, the product whose CTSP Code is 35.03.300 (Gelatin, Gelatin Derivatives, Fish Glues, Animal Glues), realized 1.7 billion dollars export and 1.8 billion dollars imports in 2019. Turkey has a very low share in the world gelatin trade volume.

When the world exporting countries are analyzed, Brazil, Germany, China, America, Belgium, France, Netherlands and Italy take the biggest share respectively. Brazil, which ranks first among the exporting countries, accounts for 8% of the global gelatin trade volume in 2019.

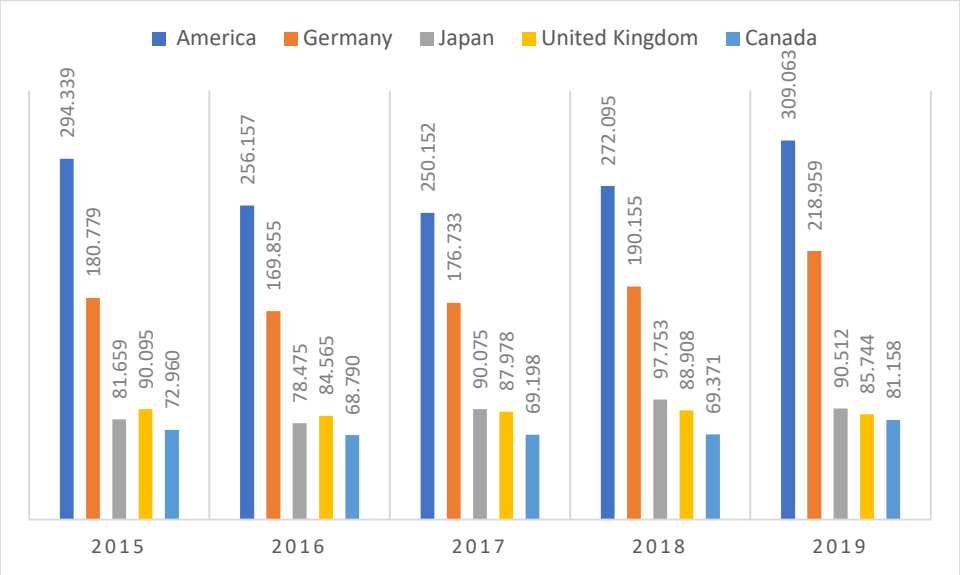
Figure 5. World Gelatin (CTSP 35.03.300) Export Top 5 Countries (Thousand Dollars)



Source: ITC

When the world importing countries are examined, the USA, Germany, Japan, England, Canada, Belgium, the Netherlands and France take the first places, respectively.

Figure 6. World **Jelatin(GTİP 35.03.300)** *Import 5 Top Countries (Thousand Dollars)*



Source: ITC

Table 9. World Gelatin (CTSP 35.03.300) Trade Volume (Thousand $)

Year	Export	Import	Volume
2019	1.659.723	1.798.890	3.458.613
2018	1.602.166	1.753.837	3.356.003
2017	1.676.681	1.822.463	3.499.144
2016	1.672.800	1.870.579	3.543.379
2015	1.795.798	1.964.379	3.760.177

Source: ITC

1.4.1. Export

T*urkey's gelatin export consists of five main product groups namely "gelatin", "other glues of animal origin", "gelatin capsules", "bone glues" and "gelatin derivatives", and the subject of this pre-feasibility study is the production of "gelatin". In this respect, the export information of "gelatin" and other gelatin products for the years 2015-2019 are presented below.*

Gelatin Export

When the gelatin export is examined, a total of 205,107,466 kg export was realized between 2015-2019. It is seen that exports have increased gradually over the 5-year period, and there has been an increase of 1s48% from 2015 to 2019. While European countries such as Germany, Spain and Switzerland are among the destinations with most of exports, there are also Middle Eastern countries such as Iran and Iraq.

Table 10. Gelatin Export (kg)

Countries/Years	2019	2018	2017	2016	2015
France	24.022	34.475	132.000	117.600	0
The Netherlands	132.030	0	62.000	130	40.088
Germany	1.125.182	498.120	673.467	214.769	175.225
Italy	238.025	328.250	130.675	80.000	40.000
United Kingdom	485.085	417.500	218.844	298.337	211.190
Greece	73.218	75.555	41.079	5.333	72
Spain	568.650	1.220.616	664.710	20.000	4.200
Belgium	0	500	100	2.632	0
Austria	7.140	40.000	3.000	0	33
Switzerland	1.615.797	1.847.415	1.602.570	1.007.636	823.608
Sweden	0	10.125	20.250		
Latvia	75.000	15	0	0	0
Esthonia	0	0	0	557	0
Lithuania	0	0	0	150	22
Poland	0	450	0	363	1.961
Slovakia	60.200	80.000	60.250	20.450	0
Hungary	62.036	46.000	61.152	48.114	63.232
Romania	17.097	12.000	10.000	8.675	0
Bulgaria	1.107	3.779	3.112	2.938	2.104
Albania	1.862	6.280	3.637	763	3.053
Moldova	0	0	0	2.249	0
Ukraine	0	0	0	0	1.233
Russian Federation	1.195	0	0	0	3.974
Georgia	4.896	4.369	2.000	3.494	666
Azerbaijan	3.864	3.550	3.050	4.241	1.200
Kazakhstan	21	5.750	500	0	0
Turkmenistan	2.268	0	34.000	2.040	3.033
Uzbekistan	30.061	17.962	14.109	368	747
Tajikistan	5.000	3.000	1.000	500	72
Kyrgyztsan	154	0	0	1.261	1.100
Croatia	95	0	0	0	0
Bosnia-Herzegovina	0	0	0	57	1.737
Kosovo	1.199	522	1.000	446	2.412
Montenegro	0	0	0	26	0
North Macedonia	4.060	2.293	9.593	1.548	1.675
Serbia	30.221	40.000	34.730	35.551	50.508
Morocco	8.335	16.000	10.000	5.698	484
Algeria	37	10.275	55.550	10.927	14.222
Tunis	16.000	11.277	8.000	11.000	1.000
Libya	156	56	0	0	0
Egypt	10.725	0	59	22.845	22.650
Burkina Faso	497	0	0	0	0
Niger	203	0	0	0	0
Djibouti	21	0	0	0	0
Sudan	0	0	1.200	0	0
Kongo	0	0	0	5.000	0
Tanzania	200	175	0	0	175
America	58.747	38.000	0	0	0
Brasil	25	0	0	0	0
T.R.N.C	6.025	4.766	1.705	551	1.763
Lebanon	0	5.000	1.031	0	977
Syria	53	1.937	0	0	8.000
Iraq	313.638	242.168	249.362	114.735	107.281
Iran	1.557.950	1.167.785	939.223	1.432.107	1.082.000
Israel	553	2.419	29	1.244	400

Jordan	***40.132***	***45.300***	***50.000***	***0***	***21***
Saudi Arabia	***2.104***	***0***	***515***	***63***	***11.972***
Kuwait	***2.944***	***0***	***25***	***2.018***	***0***
Qatar	***3.599***	***1.636***	***0***	***0***	***120***
UAE	***20.000***	***90***	***84***	***0***	***60.060***
Yemen	***44***	***2.500***	***0***	***0***	***0***
Oman	***8***	***0***	***0***	***0***	***0***
Afghanistan	***722***	***0***	***0***	***0***	***25***
Pakistan	***21***	***132.000***	***48.000***	***0***	***0***
Sri Lanka	***50.000***	***48.000***	***0***	***0***	***0***
India	***0***	***70.415***	***80.000***	***15.000***	***2.000***
Vietnam	***0***	***40.000***	***59.525***	***75***	***0***
Thailand	***140.000***	***12.775***	***0***	***0***	***0***
Singapore	***0***	***0***	***2.000***		
Philippiens	***0***	***0***	***5.000***	***5.000***	***0***
Indonesia	***0***	***0***	***0***	***0***	***25***
South Korea	***0***	***50***	***1.005***	***400***	***0***
Japan	***10.000***	***60.000***	***26.000***	***0***	***20.000***
New Zealand	***40.000***	***0***	***0***	***0***	***0***
İstanbul Industrial Free ***Zone***	***553***	***0***	***3.800***	***875***	***3.500***
Mersin Free Zone	***21.550***	***633***	***0***	***0***	***600***
Ege Free Zone		***3.800***	***5.000***	***5.000***	
Trakya Free Zone	***82***	***109***	***86***	***77***	***0***
Çorlu Europe Free ***Zone***	***0***	***0***	***50***	***0***	***25***
Total	***6.874.409***	***6.615.692***	***5.334.077***	***3.512.843***	***2.770.445***

Source: TURKSTAT

<u>Export of Gelatin Derivatives</u>

When the export of gelatin derivatives is examined, a total of 3,709 kg export was realized between 2015 and 2019. In the 5-year period, most of the export was realized as 1,190 kg in 2019. Bulgaria and Serbia are among the top export countries. According to the gelatin derivatives export table covering the years 2015-2019, there is no country that exports regularly.

Table 11. Gelatin Derivatives Export (kg)

Countries	2019	2018	2017	2016	2015
Belgium	139	0	0	0	0
Belarus	0	30	0	0	0
Estonia	0	0	0	191	0
Lithuania	0	0	0	42	0
Poland	0	0	0	365	0
Romania	0	0	0	0	25
Bulgaria	0	0	0	0	579
Albania	0	0	605	0	0
Uzbekistan	0	25	0	0	0
Georgia	0	0	66	0	3
Azerbaijan	55	0	0	102	0
Ozbekistan	50	0	33	0	0
Serbia	735	0	0	0	0
Egypt	211	0	0	0	0
Canada	0	0	0	0	40
Iraq	0	0	0	0	20
South Korea	0	0	0	200	0
T.R.N.C.	0	193	0	0	0
Total	1.190	248	704	900	667

Source: TURKSTAT

Export of Other Glues of Animal Origin

When the export of othe glues of animal origin is examined, a total of 1,597,854 kg export was realized in 2015 and a decrease of 28% was realized in the 5-year period.

Germany, Italy and Spain are among the countries with most of the exports in the last 5 years, and they correspond to 76% of the 5-year total exports.

Table 12. Other Animal Glues Export Amount (kg)

Countries/Years	2019	2018	2017	2016	2015
France	0	0	25.000	22.000	0
The Netherlands	40.000	100.000	80.000	60.000	40.000
Germany	286.000	330.067	220.000	310.025	384.641
Italy	360.000	246.250	298.718	397.091	495.553
Greece	3.000	2.000	8.336	10.677	3.531
Spain	372.800	359.000	360.000	260.000	140.000
Belgium	124	0	0	0	0
Switzerland	2.400	0	0	0	147.611
Sweden	0	298	0	0	0
Czechia	0	0	4.451	0	0
Lithuania	0	0	0	132	0
Slovakia	0	0	2.112	99	0
Hungary	0	0	183	0	0
Romania	0	1.393	189	0	0
Bulgaria	566	1.599	466	60	96

Moldova	*0*	*0*	*4.396*	*0*	*0*
Ukraine	*111*	*0*	*300*	*3.200*	*200*
Belarus	*173*	*0*	*0*	*1.776*	*0*
Russian Federation	*80.000*	*100.367*	*80.000*	*80.000*	*80.062*
Georgia	*0*	*1.690*	*160*	*105*	*108*
Azerbaijan	*617*	*0*	*920*	*5.555*	*5.157*
Kazakhstan	*479*	*0*	*0*	*0*	*0*
Uzbekistan	*0*	*759*	*464*	*0*	*0*
Turkmenistan	*0*	*183*	*0*	*910*	*792*
Kyrgyzstan	*0*	*288*	*0*	*0*	*0*
Bosnia-Herzegovina	*130*	*0*		*460*	*0*
Kosovo	*120*	*0*	*0*	*0*	*0*
North Macedonia	*0*	*0*	*540*	*237*	*40*
Serbia	*0*	*229*	*53*	*766*	*160*
Algeria	*0*	*0*	*278*	*0*	*238*
Morocco	*0*	*0*	*10.000*	*10.000*	*0*
Egypt	*0*	*0*	*0*	*0*	*0*
Ethiopia	*0*	*0*	*0*	*0*	*401*
America	*0*	*36.000*	*54.000*	*0*	*72.000*
T.R.N.C	*0*	*0*	*0*	*0*	*556*
Lebanon	*56*	*0*	*0*	*1.796*	*0*
Syria	*0*	*0*	*0*	*110*	*0*
Iraq	*0*	*0*	*464*	*919*	*245*
Iran	*0*	*8.060*	*171*	*1.000*	*206.187*
UAE	*0*	*0*	*0*	*0*	*20.000*
Afghanistan	*0*	*0*	*0*	*0*	*276*
Israel	*0*	*200*	*351*	*1.058*	*0*
Japan	*0*	*0*	*20.000*	*40.000*	*0*
Ege Free Zone	*0*	*102*	*0*	*0*	*0*
Total	*1.146.576*	*1.188.485*	*1.171.552*	*1.207.976*	*1.597.854*

Source: TURKSTAT

Gelatin Capsules Export

The export of Gelatin Capsules was 10,620 kg in total between 2015-2019. A 27% decrease is observed between 2015-2019. The most exported countries include Belgium, Slovenia and South Korea.

Table 13. Gelatin Gelatin Capsules Export Amount (kg)

Countries	*2019*	*2018*	*2017*	*2016*	*2015*
The Netherlands	*0*	*0*	*0*	*1.500*	*0*
Germany	*0*	*9*	*19*	*0*	*0*
Italy	*0*	*45*	*1*	*0*	*0*
Spain	*0*	*0*	*0*	*148*	*0*
Belgium	*85*	*0*	*0*	*708*	*1.871*
Romania	*0*	*5*	*0*	*0*	*0*
Georgia	*0*	*8*	*0*	*0*	*0*
Kazakhstan	*0*	*92*	*0*	*13*	*46*
Uzbekistan	*489*	*127*	*45*	*40*	*308*
Kyrgyzstan	*0*	*0*	*3*	*0*	*0*
Slovenia	*1.563*	*0*	*1.070*	*0*	*0*
Croatia	*0*	*0*	*637*	*0*	*0*

Morocco	*0*	*0*	*11*	*0*	*0*
Algeria	*78*	*280*	*123*	*0*	*0*
Libya	*18*	*0*	*8*	*0*	*0*
Jordan	*0*	*0*	*0*	*10*	*0*
South Korea	*612*	*0*	*648*	*0*	*0*
Total	*2.845*	*566*	*2.565*	*2.419*	*2.225*

Source: TURKSTAT

Bone Glues Export

When the bone glues export was examined, a total of 4,049 kg export was realized between 2015-2019. In the 5-year period, the highest level of export was realized as 2.504 kg in 2017. In 2019, it is seen that no exports were made. Turkmenistan and Sudan are among the top export countries. According to the bone glues export table covering the years 2015-2019, there is no country that exports regularly.

Table 14. Bone Glues Export (kg)

Countries/Years	*2019*	*2018*	*2017*	*2016*	*2015*
Romania	*0*	*0*	*2*	*4*	*0*
Azerbaijan	*0*	*83*	*0*	*0*	*0*
Uzbekistan	*0*	*95*	*0*	*0*	*0*
Turkmenistan	*0*	*0*	*2.000*	*0*	*0*
Libya	*0*	*0*	*105*	*0*	*0*
Egypt	*0*	*0*	*300*	*0*	*0*
Sudan	*0*	*0*	*97*	*897*	*395*
Mozambique	*0*	*0*	*0*	*21*	*0*
Hong Kong	*0*	*0*	*0*	*38*	*12*
Total	*0*	*178*	*2.504*	*960*	*407*

Source: TURKSTAT

As can be seen from the tables above; the production of gelatin, which is the subject of this feasibility, has the biggest share in the exports of these products, both in terms of quantity and value.

1.4.2. Import

Gelatin Import

Between 2015-2019, there was a 37% decrease in gelatin imports, and there was a steady increase in 2015-2018. Brazil and Argentina are among the countries with the highest import.

Table 15. Gelatin Import (kg)

Countries/Years	*2019*	*2018*	*2017*	*2016*	*2015*
France	*15.001*	*11.120*	*10.021*	*9.510*	*11.035*
Germany	*70.415*	*34.392*	*48.585*	*42.324*	*47.767*
Italy	*18.558*	*8.571*	*6.257*	*9.834*	*12.643*
United Kingdom	*0*	*1.216*	*278*	*17.546*	*587*
Ireland	*0*	*0*	*0*	*0*	*50*

Spain	*0*	*0*	*0*	*0*	*100*
Belgium	*225*	*200*	*150*	*24.150*	*400*
Avustria	*0*	*20.000*	*0*	*0*	*0*
Switzerland	*0*	*20.801*	*392*	*0*	*0*
Sweden	*0*		*20*	*0*	*0*
Hungary	*0*	*8.000*	*0*	*0*	*0*
Romania	*2.000*	*0*	*0*	*0*	*0*
Bulgaria	*0*	*0*	*0*	*0*	*117*
Russian Federation	*0*	*0*	*18*	*0*	*0*
Georgia	*0*	*0*	*0*	*55*	*0*
Algeria	*0*	*10.000*	*0*	*0*	*0*
Egypt	*0*	*25*	*0*	*0*	*0*
Uganda	*25*	*0*	*0*	*0*	*0*
United States	*37*	*66*	*38*	*0*	*1*
Colombia	*0*	*0*	*119.000*	*175.000*	*433.000*
Brasil	*1.133.351*	*1.004.580*	*1.490.904*	*1.744.625*	*1.889.450*
Argentina	*195.600*	*12.600*	*454.000*	*774.000*	*784.100*
Pakistan	*336.700*	*140.000*	*140.000*	*80.400*	*140.000*
India	*0*	*0*	*0*	*10.000*	*40.000*
China	*383.145*	*37.600*	*63.025*	*101.700*	*38.549*
South Korea	*44.500*	*20.500*	*37.500*	*55.500*	*58.550*
Japan	*0*	*0*	*0*	*19.992*	*0*
Total	*2.199.557*	*1.329.671*	*2.370.188*	*3.064.636*	*3.456.349*

Source: TURKSTAT

Gelatin Derivatives Import

Between 2015-2019, the import of Gelatin Derivatives was 55.552 kg in total and there was a 40% decrease in the 5-year period, with irregular purchases in 2015-2019. Germany is the country from which Turkey makes most of the purchases and an increase over 100% was realized between the years 2015-2019. Germany consititues 69% of Turkey's total Gelatin Deriatives import in the 5-year period.

Table 16. Gelatin Derivatives Import (kg)

Countries/Years	*2019*	*2018*	*2017*	*2016*	*2015*
Germany	*11.200*	*7.175*	*7.500*	*8.050*	*4.500*
France	*2*	*1*	*0*	*0*	*0*
Italya	*0*	*0*	*0*	*0*	*2*
United Kingdom	*0*	*0*	*0*	*137*	*0*
Belgium	*0*	*0*	*0*	*8*	*0*
South Korea	*0*	*0*	*0*	*400*	*15.050*
Pakistan	*0*	*500*	*500*	*0*	*0*
United States	*1*	*2*	*1*	*0*	*0*
Canada	*0*	*23*		*0*	*0*
China	*500*	*0*	*0*	*0*	*0*
Total	*11.703*	*7.701*	*8.001*	*8.595*	*19.552*

Source: TURKSTAT

Import of Other Glues of Animal Origin

When the Import of Other Glues of Animal Origin is examined, a total of 1,680,196 kg export was realized between 2015-2019. In the 5-year period, the highest export was 381,946 kg in 2019. Germany and Spain are among the top import countries.

Table 17. Other Animal Glues Import (kg)

Countries/Years	2019	2018	2017	2016	2015
France	0	16	0	0	0
Germany	163.164	160.095	192.359	161.510	4.447
Italy	0	0	471	0	12.960
Spain	199.716	168.800	174.624	182.313	182.440
Belgium	2.000	0	0	0	300
Bulgaria	0	0	0	0	3.000
Egypt	15.000	15.000	0	25.000	10.000
United States	0	0	1	52	93
Canada	0	61	0	128	0
India	66	75	163	74	14
China	2.000	0	0	4.164	90
Total	381.948	344.047	367.618	373.241	213.344

Source: TURKSTAT

Gelatin Capsules Import

Imports of Gelatin Capsules increased by 21% between 2015-2019, and there is a steady increase in 2015-2019. Belgium and South Korea are among the countries with the highest import. European countries such as France, the Netherlands, Germany constitute 80% of the five-year Gelatin Capsules Import of Turkey.

Table 18. Gelatin Capsules Import (kg)

Countries/Years	2019	2018	2017	2016	2015
France	10.543	10.918	8.387	8.573	9.140
The Netherlands	0	0	0	0	90
Germany	2.558	5	15	0	19
Italy	11.130	758	7.155	0	0
United Kingdom	28	0	0	0	0
Spain	12.897	11.092	16.584	9.567	7.158
Belgium	220.117	203.035	186.565	162.455	156.435
Hungary	0	0	0	0	21
Romania	21.542	7.413	6.971	11.150	15.795
Croatia	9.473	25.531	9.279	8.494	12.325
South Africa	0	0	0	10	0
United States	436	1.197	2.178	25	0
Colombia	4.190	5.455	2.422	2.445	2.909
India	8.234	10.103	13.728	7.176	9.743
China	490	1.933	2.439	3.365	2.818
South Korea	30.103	35.566	40.690	47.736	57.227
Japan	806	327	635	1.253	669
Taiwan	5	0	0	0	0
Total	332.552	313.333	297.048	262.249	274.349

Source: TURKSTAT

Bone Glues Import

Turkey imports of Bone Glue is made only from the Netherlands in 2016 and 2018 and total import value was 17,600 kg.

Table 19. Bone Glue Import (kg)

Countries/Years	*2019*	*2018*	*2017*	*2016*	*2015*
The Netherlands	*0*	*9.600*	*0*	*8.000*	*0*

Source: TURKSTAT

Table 20. Exports of Gelatin and Similar Products by Years

	Gelatin		Gelatin Derivatives		Solid Ichthyokol		Bone Glues		Other Glues of Animal Origin		Gelatin Capsule	
Year	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)
2019	6.874.409	38.452.859	1.190	4.817	0	0	0	0	1.146.576	2.471.639	2.845	125.821
2018	6.615.692	29.635.482	248	845	0	0	178	223	1.188.485	2.621.839	566	35.991
2017	5.334.077	24.476.139	704	1.657	0	0	2.504	9.922	1.171.552	2.487.829	2.565	77.089
2016	3.512.843	19.140.787	900	4.201	0	0	960	14.243	1.207.976	2.371.889	2.419	58.247
2015	2.770.445	15.715.264	667	2.084	0	0	407	3.705	1.597.854	4.418.052	2.225	267.993

Source: TURKSTAT

Table 21: Imports of Gelatin and Similar Products by Years

	Gelatin		Gelatin Derivatives		Solid Ichthyokol		Bone Glues		Other Glues of Animal Origin		Gelatin Capsule	
Year	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)	Export Amount (Kg)	Export Value ($)
2019	2.199.557	13.464.615	11.703	143.799	0	0	0	0	381.946	714.715	332.552	14.059.157
2018	1.329.671	6.926.614	7.701	102.086	0	0	9.600	23.672	344.047	650.355	313.333	15.092.856
2017	2.370.188	12.338.720	8.001	100.414	60	5.265	0	0	367.618	605.633	297.048	13.081.922
2016	3.064.636	18.376.570	8.595	110.258	103	3.781	8.000	16.494	373.241	658.355	262.249	11.717.780
2015	3.456.349	22.490.184	19.552	81.305	152	4.948	0	0	213.344	319.563	274.349	13.898.638

Source: TURKSTAT

Figure 7. Turkey Gelatin Industry Foreign Trade Assessment

According to export and import data of gelatin and related products of Turkey examined in detailed between 2015-2019;

- ***Gelatin exports increased by 40% between 2015-2019.***
- ***Despite being an importer in Gelatin Derivatives trade, it increased its export by 56% between 2015-2019,***
- ***As the sector is new in Turkey, it has a low share in World trade,***
- ***Production in the sector is performed by the four companies mentioned above,***
- ***The trade volume of the sector is mainly ensured by four companies as in production.***

In the annual industrial product statistics published by TURKSTAT, these figures could not be reached due to the confidentiality of the data related to the production and sales of gelatin and its derivatives in accordance with Article 13 of the TURKSTAT Law No. 5429. In this respect; it is not possible to accurately calculate total supply, domestic and total demand.

However, based on the realized export and import amounts and the food gelatin production capacity in the TOBB Database, the total supply and demand have been tried to be calculated. This calculation is based on the following assumptions.

- ***Total supply equals total demand,***
- ***Production is made up to the installed capacity,***
- Export and import figures are calculated based on 2019 data,
- ***Exports are substracted from the total of manufactured products and imports, the remaining product being consumed domestically,***
- ***Based on the fact that no incentive certificate has been issued for the said investment for more than 5 years, the installed capacity obtained from TOBB Database in August 2020 was predicted to be the same in 2019, and the domestic demand amount was estimated to be 5.2 thousand tons.***

Table 22: Domestic Demand for Gelatin and Gelatin Derivatives

Indicators	*Kg*
Production	*9.861.600*
Import	*2.211.260*
Total Supply	*12.072.860*
Export	*6.875.599*
Domestic Demand	*5.197.261*
Toplam Talep	*12.072.860*

Source: Calculated based on TURKSTAT and TOBB Industry Data (Access Date 24.07.2020)

Considering the steady increase in exports over the years, the increasing demand for gelatin produced according to Islamic methods, and the continuous growth of world gelatin trade volume, it can be said that the demand for gelatin will increase steadily in the coming periods (provided that extraordinary issues such as pandemics etc. are not experienced).

On the other hand, when Turkey gelatin export and import realizations are evaluated together, import decreased regularly in parallel to the increase of domestic production. In this respect, it can be said that if the investment in the said facility is completed and production starts, imports will decrease, exports will increase further and this will contribute positively to the balance of payments.

Note: If product-based world export and import data are not the same; countries to register by defining GTIPs with different codes in customs clearance; While buying FOB / FCA value in export; It was stated in an expert opinion that there may be reasons such as CIF / CIP value taking in import.

1.5. Production, Capacity and Demand Estimation

As stated in previous sections;

- ***Gelatin production in Turkey is carried out by only 4 firms actually.***
- ***Over the years, imports increase along with exports, but the increase in exports is higher than imports except 2019, amounts of imports are decreasing. Brazil stands out and draws attention in imports.***
- ***Although domestic consumption is not known exactly as production figures cannot be reached, it can be easily said that it will grow in parallel with the expansion of the food sector.***
- ***Incentive certificates were screened and no incentive certificate was found for gelatin. Of course, it is possible to say that the installed capacity will remain the same in the medium term, although it does not constitute a final position.***
- ***Gelatin exports are expected to continue to grow by 1.2% and foreign trade by 1.1% in the coming years.***

Figure 8. Development of Turkey's Gelatin Foreign Trade

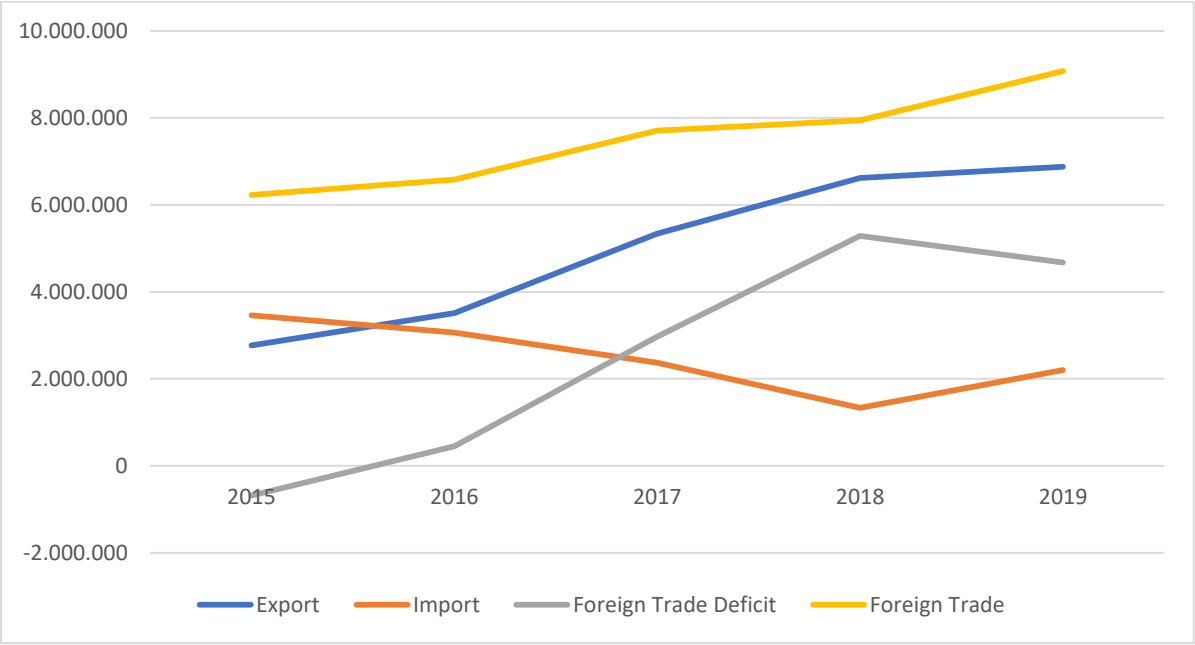


Table 23. Growth Rates in Gelatin Foreign Trade

Items/Years	*2016*	*2017*	*2018*	*2019*	*Average*
Export	*1,27*	*1,52*	*1,24*	*1,04*	*1,27*
Import	*0,89*	*0,77*	*0,56*	*1,65*	*0,97*
Foreign Trade	*1,06*	*1,17*	*1,03*	*1,14*	*1,10*

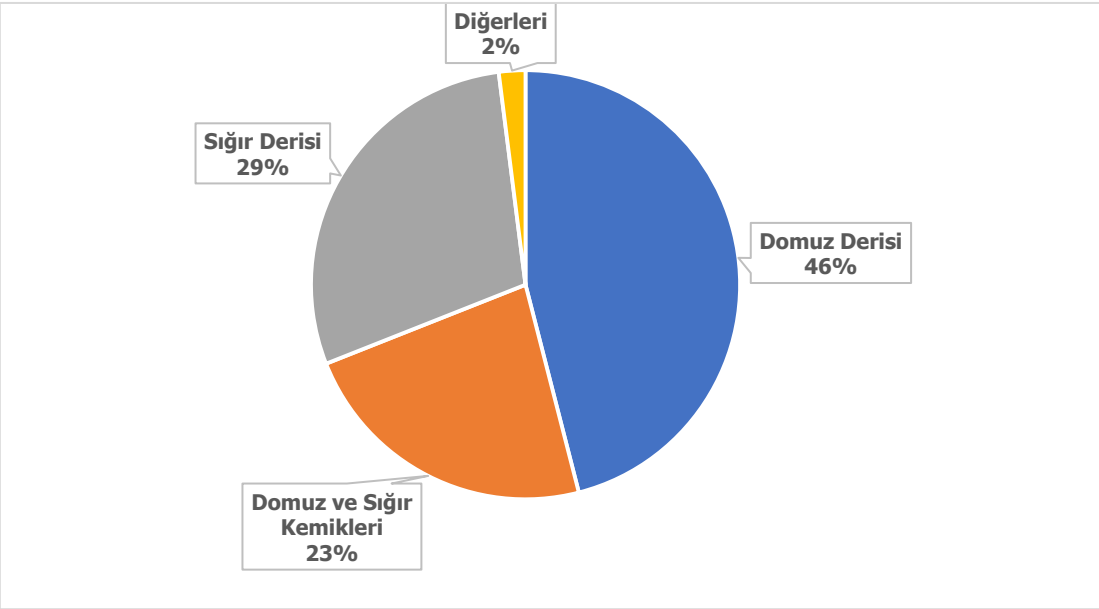
Within the framework of the aforementioned issues and expectations, the installed capacity for the facility has been selected as not aggressive but taking into account the economies of scale.

1.6. Input Market

Gelatin can be produced from different collagen sources. For commercially produced gelatin, generally bovine bones and leather, pig skin and especially recently fish skin are also used. The raw material of the gelatin to be produced at the facility is bovine (cattle) bones. Since ovine bones cannot provide the desired quality and yield, they are not used in gelatin production.

The raw materials used in gelatin production and their usage rates are given below. Accordingly, it is seen that pig skin and bones have a significant share in global gelatin production.

Figure 9. Distribution of Gelatin Production According to the Raw Material Used



Source: Preparation and Processing of Religious and Cultural Foods

The amount of cattle slaughter done in Konya and selected provinces as of 2015-2019 is given in the tables below. For the selection of the provinces, the number of slaughterhouses, the number of animals, the prevalence of beef cattle breeding and the distance to Konya were taken into account.

Considering the number of cattle, slaughterhouses and chopping facilities and the distance to Konya, the provinces with the highest potential to provide regular bone for the facility are Ankara and Afyonkarahisar.

Table 24. Approved Slaughterhouse and Chopping Facility

Province	*Slaughterhouse and Shredding Facilities*	*Distance from Konya*
Konya	***30***	***-***
Karaman	***2***	***110 km***
Afyonkarahisar	***46***	***227 km***
Burdur	***8***	***271 km***
Aksaray	***4***	***151 km***
Ankara	***97***	***262 km***
Eskişehir	***12***	***330 km***
Antalya	***35***	***302 km***
Isparta	***7***	***240 km***
Niğde	***3***	***249 km***
Nevşehir	***4***	***221 km***
Kırşehir	***4***	***243 km***
Sivas	***12***	***502 km***

Source:
http://ggbs.tarim.gov.tr/cis/servlet/StartCISPage?PAGEURL=/FSIS/ggbs.onaylilisletmeSorgu.html&POPUPTITLE=AnaMenu data were used.

On the other hand, the calculations regarding the bone potential that can be obtained with the cattle assets of the provinces listed in the table above in terms of raw material supply, except the slaughterhouse and chopping facilities, are given below. As only the statistics of number of animals slaughtered throughout Turkey are used by TSI when doing calculations on province basis, the number of animals slaughtered and data about bone that can be obtained by province were calculated based on average values for Turkey.

In this respect, average bovine carcass weight is 240 kg in our country as of 2015-2019, and the amount of bone obtained from bovine carcass with a calculation of 15% is approximately 36 kg. According to the average of 2015-2019, the potential amount of bone to be obtained from the twelve provinces determined is calculated below.

Konya: 194,383 animals x 36 kg = 6,998 tons fresh bones

Karaman: 15,119 animals x 36 kg = 544 tons fresh bones

Afyonkarahisar: 84,228 animals x 36 kg = 3,032 tons fresh bones

Burdur: 49,006 x 36 kg = 1,764 tons fresh bones

Aksaray: 53,819 x 36 kg = 1,937 tons fresh bones

Ankara: 102,220 x 36 kg = 3,680 tons fresh bones

Eskişehir: *32,970 x 36 kg = 1,187 tons fresh bones*

Antalya: 40,094 x 36 kg = 1,443 tons fresh bones

Isparta: 33,518 x 36 kg = 1,207 tons fresh bones

Niğde: *36,239 x 36 kg = 1,305 tons fresh bones*

Nevşehir: *19,708 x 36 kg = 709 tons fresh bones*

Sivas: 72,955 x 36 kg = 2,626 tons fresh bones

Hinterland Total: 26,432 tons fresh bones

Turkey General Potential Bone Quantity: 131,957 tons fresh bones

With the raw material collection centers to be established, approximately 20% of the cattle bones produced in the country will be covered. However, if needed, fresh bones can be obtained from other provinces.

Table 25. Cattle Stock and Number of Slaughtered Cattle

Indicators/Years		*2015*	*2016*	*2017*	*2018*	*2019*	*Average*
Turkey	*Number*	*13.944.071*	*14.080.155*	*15.943.586*	*17.042.506*	*17.688.139*	*15.739.691*
	Cattle Slaughtered (number)	*3.765.077*	*3.900.307*	*3.602.115*	*3.426.180*	*3.633.730*	*3.665.482*
	Cattle Slaughtered (%)	*26,7*	*27,5*	*22,4*	*20,0*	*20,4*	*23,0*
Konya	*Number*	*739.833*	*752.221*	*867.950*	*920.746*	*926.217*	*841.393*
	Cattle Slaughtered (number)	*197.535*	*206.861*	*194.421*	*184.149*	*188.948*	*194.383*
Karaman	*Number*	*59.206*	*64.301*	*62.238*	*68.266*	*71.134*	*65.029*
	Cattle Slaughtered (number)	*15.808*	*17.683*	*13.941*	*13.653*	*14.511*	*15.119*
Afyonkarahisar	*Number*	*342.601*	*314.984*	*367.997*	*384.667*	*410.199*	*364.090*
	Cattle Slaughtered (number)	*91.474*	*86.621*	*82.431*	*76.933*	*83.681*	*84.228*
Burdur	*Number*	*205.023*	*198.644*	*208.934*	*222.843*	*217.124*	*210.514*
	Cattle Slaughtered (number)	*54.741*	*54.627*	*46.801*	*44.569*	*44.293*	*49.006*
Aksaray	*Number*	*180.648*	*189.644*	*234.638*	*265.404*	*309.168*	*235.900*
	Cattle Slaughtered (number)	*48.233*	*52.152*	*52.559*	*53.081*	*63.070*	*53.819*
Ankara	*Number*	*338.801*	*356.771*	*462.250*	*536.495*	*547.478*	*448.359*

	Cattle Slaughtered (number)	*90.460*	*98.112*	*103.544*	*107.299*	*111.686*	*102.220*
Eskişehir	*Number*	*128.141*	*131.152*	*136.388*	*154.699*	*162.148*	*142.506*
	Cattle Slaughtered (number)	*34.214*	*36.067*	*30.551*	*30.940*	*33.078*	*32.970*
Antalya	*Number*	*154.056*	*160.612*	*173.639*	*185.579*	*191.960*	*173.169*
	Cattle Slaughtered (number)	*41.133*	*44.168*	*38.895*	*37.116*	*39.160*	*40.094*
Isparta	*Number*	*140.251*	*147.513*	*133.405*	*144.697*	*150.752*	*143.324*
	Cattle Slaughtered (number)	*37.447*	*40.566*	*29.883*	*28.939*	*30.753*	*33.518*
Niğde	*Number*	*147.852*	*141.872*	*147.892*	*172.454*	*171.988*	*156.412*
	Cattle Slaughtered (number)	*39.476*	*39.015*	*33.128*	*34.491*	*35.086*	*36.239*
Nevşehir	*Number*	*74.081*	*74.586*	*79.346*	*90.627*	*109.560*	*85.640*
	Cattle Slaughtered (number)	*19.780*	*20.511*	*17.774*	*18.125*	*22.350*	*19.708*
Sivas	*Number*	*260.246*	*266.359*	*332.329*	*351.830*	*378.583*	*317.869*
	Cattle Slaughtered (number)	*69.486*	*73.249*	*74.442*	*70.366*	*77.231*	*72.955*

Source: TURKSTAT

1.7. Market and Sales Analysis

The production of gelatine permanently increases and as a result, Turkey switched from importer to exporter position. In last years, it has found wide usage area in many sectors and many products due to its stabilizer, thickener, strong shaping ability, transparent gel formation, flexible film formation, easy to digest, soluble in hot water and easily shaping properties. As it is preferred compared with other alternative products due to its protein predominance and other advantages indicates that the consumption of gelatin will increase in the coming periods.

As there is a wide range of usage areas for the gelatin supplied by the branches of world manufacturers present in Turkey or by direct importation from the world and as it is a delicate product in the sense of "halal food" for the consumers of food sector, the company that will produce this product ***in Turkey has to take into consideration this sensibility for the raw material used.***

Regarding Konya, in the "Past, Present and Future of Konya Food Sector"[4] report prepared by Konya ABİGEM, supported by Mevlana Development Agency, the number of registered producers in ***chocolate production on the basis of sub-sectors is 49, the installed capacity is 55,542 tons, the number of registered companies in soft candy production is 11 with an installed capacity of 9,894 tons and their presence further demonstrates the potential for gel use.***

When considering Konya food industry, the priority market for the produced gelatin will be Turkey with Konya and Karaman at the top positions and the Islamic countries in the long term.

[4] https://www.kalkinmakutuphanesi.gov.tr/assets/upload/dosyalar/6-gida.pdf

However, when the investment is made regarding feasibility for a healthy market and consequently regular product sales, the manufacturer should analyze the structure of the sector well and organize the sales and marketing channels in accordance with the intense competition conditions in the market and contact the users of the product at the stage of the investment and make sales connections in advance. The company should focus on advertising within the framework of sales and marketing activities at the initial stage of investment and introduce the product to domestic companies with all its features. At this stage, they should contact the important users of the product (Eti, Ülker, Kent, *Saray, etc.) and inform them about the stages of the investment to be made and the product to be produced, and should convince the consumers of the product regarding the quality of the product and make connections. In the next stage, advertisements should be published in mass media, while developing a sales-marketing-distribution channel, and on the other hand, the producers in the world should be followed and R&D studies should be focused on. At this stage, it is considered to be beneficial to advertise both in the media organs of the industries where gelatin is used and in the sectoral media organs of the customer group. Promotion can be made by participating in sectoral fairs. Web pages that provide detailed information about the products and production conditions can be designed to promote the product both in the country and abroad.*

The subject of feasibility is competitive in terms of the investors in obtaining the gelatin from the existing domestic producers and the distributors of foreign companies or through importer companies; in order to be able to hold on to the market by launching its own brand, the raw material study should especially be done well, it shall have a flexible structure in product diversification according to customer demands, focus on advertising and R&D studies, and it should be aimed to meet the gelatin needs of the sectors in different blooms under competitive prices and sales conditions.

*The company should focus on advertising within the framework of sales and marketing activities at the initial stage of investment and introduce the product to domestic companies with all its properties. At this stage, they should conta*ct the important users of the product (Eti, Ülker, Kent, Saray, etc.) and *inform them about the stages of the investment to be made and the product to be produced, and should convince the consumers of the product regarding the quality of the product and make connections.*

- ***Product Sales Prices and Conditions***

The fact that gelatin is a natural protein and has technologically important features is an indicator that its production and consumption will continue to increase in the coming years. However, for consumers with special preferences and sensitivities, gelatin production under controlled conditions and meticulousness in the use of resources and the concept of "halal food" are of great importance.

When the investment subject of the feasibility is completed; powder gelatin will be produced in various blooms from bovine (cattle) bones at the facility. The average sales price of the gelatin to be produced is determined as 8.0 USD / kg excluding VAT, transportation if it is produced as the highest quality gelatine in the market according to the selection of the technolgy to be used in the facility. The

quantity and sales prices of the by-products that will be released in production are given in the Technical Review and Evaluation section of the report.

- *Estimated Sales Projection for the Facility-CUR*

It is estimated that if the sales and marketing organization is sufficient and the production is made in the desired conditions and quality in the market and as long as sufficient raw materials are available, there will be no sales problems.

Due to the small number of gelatine manufacturer in Turkey, constantly increasing exports, the use of gelatin in many sectors especially in recent years, the increasing importance of the halal food concept; if production is made in the desired quality and conditions, it is predicted that the sales will increase steadily starting from the first years and reach a high capacity utilization rate in a short time.

When considering that the installed capacity in Turkey, as mentioned in the previous sections, is 9,862 tons, and that domestic consumption is approximately 5,200 tons, 1,500 tons installed capacitymeans an addition of 15% to the available capacity and a 29% share from the domestic demand. Considering the growth rate of foreign trade, even if the facility operates with 100% CUR, it presents a possible structure.

Production capacity utilization rate will depend entirely on fresh bone supply. CURs as of the projected years and the related fresh bone need are predicted as follows.

Table 26. Projected Capacity Utilization Rates by Years and Raw Material Requirements

	First Year	Second Year	Third Year	Fourth Year	Fifth Year +
Projected Capacity Utilization Rate For 1500 TONS INSTALLED CAPACITY (%)	50%	60%	75%	85%	90%
Projected Production Amount of Gelatin (Tons)	750	900	1125	1275	1350
Required Amount Of Bone	12.750	15.300	19.125	21.675	22.950
Total Bone Potential in the Region (Ton)	26.432	26.432	26.432	26.432	26.432
The Amount of Bone That Can Be Collected by the Facility (%)	48%	58%	72%	82%	87%

CUR forecasts will be subject to the following conditions;

- *The investor company will start the raw material procurement studies close to the completion of the investment.*
- *Preliminary agreements will be signed with slaughterhouses in provinces within the hinterland.*
- *Fresh bone tenders of public institutions will be followed.*
- *The purchasing organization foreseen in the technical department will be realized.*

3. TECHNICAL ANALYSIS

3.1. Selection of Facility Location

Halal gelatin production, which is of special importance in terms of halal food production for our country, is one of the appropriate investment issues. The width of the area is also important as post-production treatment is required. In this sense, land prices will also gain importance. A 50,000 m² land is required for the facility. During the meetings with Konya Organized Industry Directorate, it was stated that no land was available for allocation. In this case, research was conducted in the districts and in the meeting with the manager of the Beyşehir Organized Industrial Zone, the ***establishment of a new organized zone was mentioned and if a well is requested, water will be reached at 150 meters. While determining the cost in the selection of land, the land unit price of this region was taken as a basis. Considering the important criteria for gelatin production, site selection predictions for Konya are given below.***

Table 27. Evaluation Regarding Location Selection

ECONOMIC FACTORS	***In terms of economic factors, Konya is in a position to provide raw materials for gelatine production from neighboring provinces. Since the gelatin market is open both domestically and internationally, the presence of an airport and a railway makes an advantage in the choice of province. The use of pressure vessels in production raises the issue of energy costs. Having natural gas in the city will affect the costs positively, even a little. It does not differ from other provinces in terms of construction costs.***
Raw Material	
Proximity to the market	
Energy / Combustible	
Labor	
Construction Coat	
NATURAL FACTORS	***In Konya, one of Turkey's top provinces with low rainfall, there is a significant reduction in groundwater. Annual usable water resource in Konya Closed Basin is 4.5 billion and consumption is 6.5 billion cubic meters. Due to the low amount of precipitation, water reserves are rapidly decreasing. Water, which is one of the most important cost items in gelatin production, must be supplied from the field. Therefore, considering the underground water reserves of Konya and its districts, site selection should be made carefully in terms of gelatine production. Konya, which is a province with low earthquake risk, is suitable for investment in this sense.***
Climate conditions	
Land / Plot status	
Natural Resources / Water	
Earthquakes and natural disasters	
SOCIAL FACTORS	***In terms of social factors, Konya province is suitable for this investment. There is potential for a trained workforce. There will be no resistance in the society regarding this investment issue.***
Trained workforce	
Society Resistance	
POLITICAL FACTORS	***All the incentives foreseen by the state for investment can be used in Konya.***
State, Economic and social support and local administration supports	

OTHER FACTORS	***Considering other factors on the basis of Konya province, it will be seen that there is no difference compared to other provinces. However, considering the treatment, which is one of the most important costs and operating expenses of the investment, having an Organized Industrial Zone in the province may make Konya more attractive.***
Supply of labor force	
Transportation Services	
Materials and services	
Legislative power bodies	
Financing	
Disposal of water and waste	

3.1.2. Production Technology

The gelatin industry constantly develops new products with intensive technology investments, and the usage areas of the produced gelatin and its derivatives are expanding. There are different production processes that can provide the most suitable conditions for the raw material used and / or the usage area and properties of the gelatin to be produced. With the technologies developed in recent years, more than 25% savings have been achieved in energy and process water consumption used in production, while the quality and efficiency of the obtained product has been consistently increased significantly.

We can talk about small and large scales in current technologies. Gelatins produced in small scales are generally those that use fish and poultry raw materials.

Use of Fish as Raw Material

Fish gelatin is generally derived from fish skin and can be conditioned using both acid and alkali. The skins can be provided from fish processors working in conjunction with fish farms or from boats making fillets (fish without bones) in the sea. However, fish skins must be thoroughly cleaned to remove the remaining oils. There it is defrosted, washed several times and treated with mineral or organic acids for a period of 24 hours. Rarely, it is also pre-treated first with lime milk to bind residual fat.

The characteristic properties of gelatin obtained from different types of fish and its usage areas also vary. For example, gelatin obtained from fish in the cold waters of the North Atlantic Region has a low gelling power, since it contains very low amounts of proline and hydroxyproline. On the other hand, these gelatins show a good film formation and have emulsifying properties. For this reason, they are especially preferred for the integration of oil-based vitamins using the spray drying technique. On the contrary, gelatin obtained from fish taken from warmer waters has a good gelling property. Since their structure is very close to other common gelatins, they are frequently used in the food and pharmaceutical industry.

Today, fish gelatin is much more expensive than traditionally obtained gelatin. This is due to the high cost of transportation and the low density of collagen in the fish skin. On the other hand, although fish bone seems suitable for gelatin production, after many studies, the gelatin industry has opposed the use of this material for economic reasons. Although fish gelatin is also a food item, there are different legal regulations in different countries regarding its allergic potential.

Use of Poultry as Raw Material

Poultry gelatin is also obtained from both fresh skin and bone materials. Since poultry are generally young when slaughtered, the material can be treated with the acid process. Poultry skins contain a lot of fat and their collagen concentration is low. For this reason, feet and similar materials are also used. Since the poultry is not demineralized normally prior to conditioning and the concentration of salts during extraction is high, a precipitation process is required after extraction. Excess salts are removed in other stages such as ultrafiltration and deionization

However, poultry gelatine production remains a niche product for now, at least in the medium term, due to the fact that skin from poultry is a raw material that is in high demand for other food applications and due to the high costs.

Collagen, which is found in cattle and pigs, is used as the main raw material in large-scale gelatin production in terms of availability and product quality. The use of collagen in fish and poultry as a raw material is more recent and is generally produced as a niche product to meet the demands of consumers of certain religions. However, although the raw materials used in gelatin production are different, the common point of all of them is that they are of animal origin.

Use of Bovine Skin as Raw Material

Another main source of collagen used in gelatin production is bovine skin. The thickness of the skin depends on the climate of the place where the cattle grows. The warmer the climate, the thinner the skin becomes. The outer skin contains less collagen and is used almost exclusively in the leather industry. The fleshy face consists of fatty tissue and is removed as a by-product while the skin is being processed. However, the middle layer called "split" is almost pure collagen, so it is an excellent raw material for gelatin production.

After treatment with alkali, the swollen hairs from the skin are removed and then the skin is divided into three separate layers with horizontal blades. With this process, it is ensured that the part called "split" is exposed. Splits can reach up to 4 m^2 in size depending on the age of the animal. The resulting splits are first cut into hand-sized pieces in cutting machines in gelatin plants and then treated with acid or alkali. In principle, non-delaminated pieces of leather can also be processed, but in this case, the skin must be de-haired by previously treated with an alkali / sulphite solution. In this case, operating efficiency and productivity are reduced as the yield is significantly reduced due to the lower collagen content. Shrinking the skin is essential for effective conditioning. Extraction is facilitated by acid and alkali processes.

One of the most important problems of the leather industry in the world and in our country is industrial waste. It is very important to use these wastes and to bring them to the economy of our country in terms of solving environmental problems and producing products with high added value. Leather solid wastes are in the category of economic value wastes due to their proteinic properties, fibrous character and high natural fat content, and are also suitable for gelatin production.

Only 20-25% of the raw leather entering the leather industry turns into finished leather and therefore industrial solid wastes with different characteristics are generated during leather production. In recent years, the evaluation and disposal of leather solid wastes has gained great importance due to productivity and environmental problems. A wide variety of wastes are generated in the leather industry. Leather industry solid wastes differ in terms of content and amount depending on the process steps they occur.

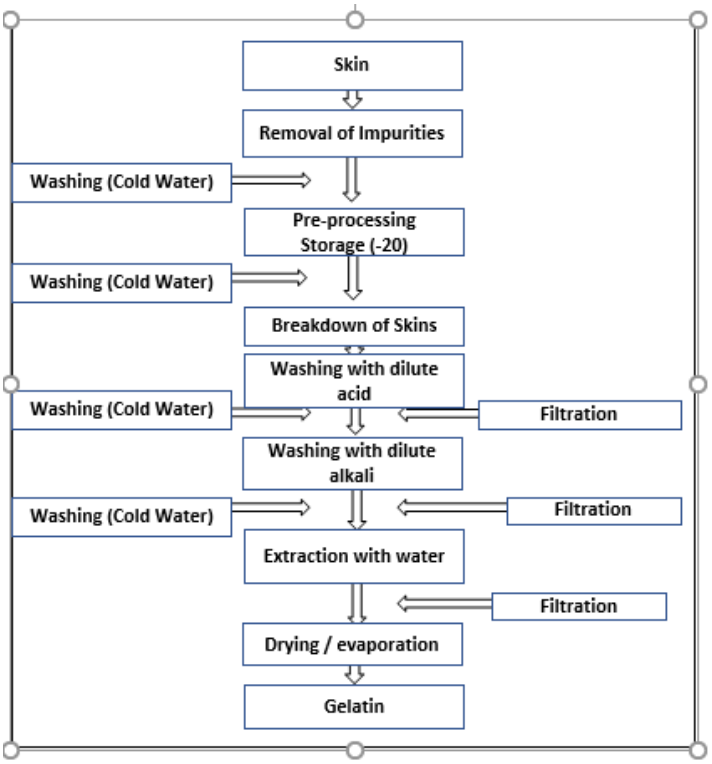
Gelatins are defined as A and B types, respectively, according to the use of acid and base in chemical hydrolysis application during production. Molecular structure of many amino acids also changes during the transformation of collagen into gelatin. Due to the different isoelectric points of A and B type gelatins, the amino acid composition is also different. The isoelectric point of type A gelatin varies between 7-9. The isoelectric point of B-type gelatin is around 5 as the amino acids asparagine and glutamine found in natural collagen are converted to acidic amino acids (aspartic and glutamic acids). Generally, A type gelatin is produced from pig skin and B type gelatin is produced from bovine skin with a more complex collagen structure.

After the outer part of the bovine skin containing less collagen and the inner fat layer are removed, the middle layer containing pure collagen remains and this layer is used as raw material for gelatin production. Hairs with low collagen content are removed from the skin in order not to reduce the gelatin yield. Later, by reducing the size of the skin, homogeneous distribution of alkali and acid applications and facilitation of extraction are ensured.

Continuous extraction method is used in the production of bovine gelatin. In this method, the raw material is continuously supplied to the extractor and high bloom value, low viscosity and light colored homogeneous gelatin is produced.

Generally, high quality gelatins are obtained from the raw material with a partially hydrolyzed collagen structure and homogeneous structure at 50 ° C temperature.Different piece size and the fact *that the pieces are obtained from animals of different ages can negatively affect the homogeneous process. The extracted gelatin solution is purified by the manufacturers in different ways. Purification processes are mainly; It consists of filtration and clarification, deionization, concentration, sterilization, drying and packaging steps.*

Figure 10. Bovine Skin Gelatin Production Scheme



As known, leather is a raw material that is highly demanded by non-food sectors. For this reason, it will be necessary to bear much more effort, competition and costs in raw material procurement compared to bone.

Use of Fresh Bone as Raw Material

In addition to fresh meat, fresh bone is also obtained in slaughterhouses and meat processing plants. This valuable source of collagen is a good osein (bone extract, bone glue) and gelatin raw material. In the production of osein, the bones are precisely crushed into cubes of approximately 0.5 cm in size, then they are defatted by washing vigorously with 85-95oC hot water for 30 minutes. With this process, leftover meat pieces that may remain on the bone are also removed completely. Then, the crushed bones are dried with hot air in the dryers operating in the continuous system and classified according to particle size by sieving. The classified bone fragments are then processed individually. During this process, oil (used in the chemical industry and by animal feed manufacturers in many countries), meat, and bone meal are obtained as by-products. Bone meal is mostly used as a fertilizer in Europe and America.

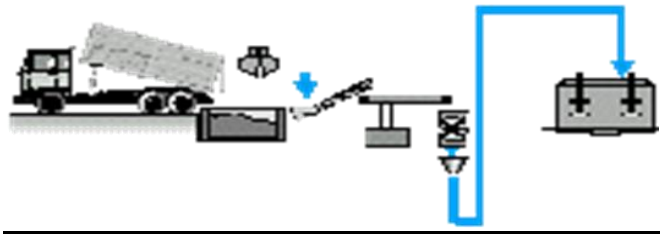
The gelatin production process described above consists of two basic stages, pre-treatment and extraction.

The purpose of the pre-treatment is to convert the water insoluble collagen in the raw material into water-soluble gelatin by treating it with acid or alkali. At this stage, a double method is often applied and after a short acid process the material is wetted with intense alkali. Then, the gelatin obtained can be obtained after five basic steps, mainly washing, extraction, purification, concentration and drying.

Pre-treatments

After complete cleaning of the raw material, it includes different pre-treatment steps, which are applied depending on the origin of the raw material.

Figure 11. Production Flow Chart



In gelatin production, two processing methods are used mainly:

Acid treatment method-for type A gelatin;

The raw material (primarily pig skin) is first subjected to a digestion process. Here, the material is treated with acid and the gelatin extraction process can be started immediately afterwards.

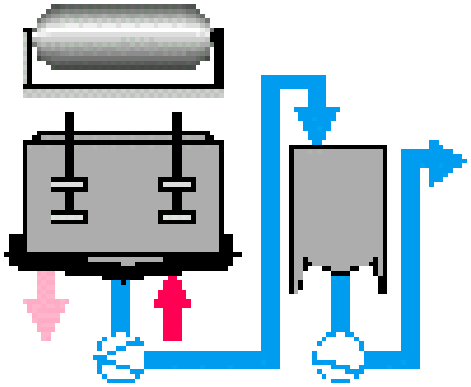
Alkali tratment method- for type B gelatin;

This process extends over a long period of time and calmly alters the structure of collagen. Only bone and skin pieces can be used here. Collagen produced in this way is dissolved in hot water.

Extraction

Hot water is then added to the pre-treated material and the multi-step extraction process is started. The first gelatin fractions obtained at low temperature have the highest degree of gelling. A solution of approximately 5% is obtained. The material is then extracted using fresh and hot water. This process continues until the smallest piece of gelatin is extracted using boiling water. The product is obtained as a result of extraction very close to complete.

Figure 12. Extraction

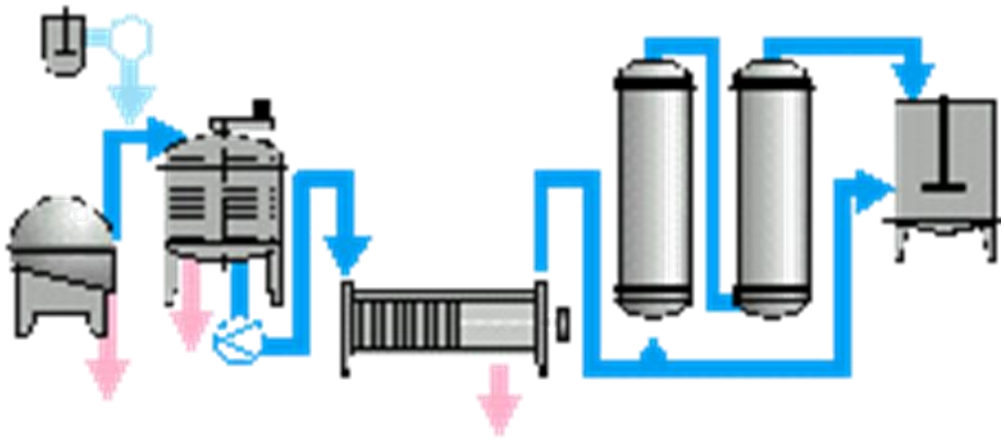


Purification

A gelatin solution of 5% approximately obtained from the extraction process is purified from oil and fiber residues by the use of high performance separators. Pre-treatment is completed by passing through the cleaner.

Pre-layer filters, which ensure the maximum amount of fine particles retention, are then passed through cellulose plate filters similar to those used in the beverage industry. The purified material is then passed through columns containing an ion exchange resin where gelatin is freed from calcium, sodium, acid residues and other salts, depending on the conditions.

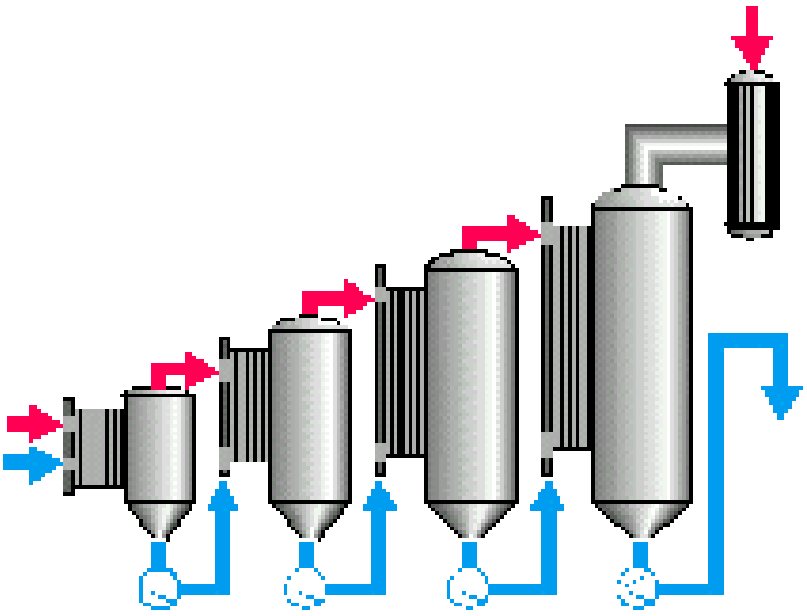
Figure 13. Purification



Concentration

Ön ısıtma donanımlı çok kademeli vakum evaparatorler,jelatin solüsyonunu sterilize etmek için kullanılır. Aynı zamanda enerjinin minimum kullanımı ile, seyreltik çözeltiden yumuşak bir tarzda su uzaklaştırılarak bal kıvamında bir konsantre elde edilir. Yüksek viskos özellikteki solüsyon, daha s***onra*** tekrar sellüloz plakalardan oluşan filtrelerinden geçirilir. Herhangi kalmış kalıntılar da uzaklaştırılmış ***olur.***

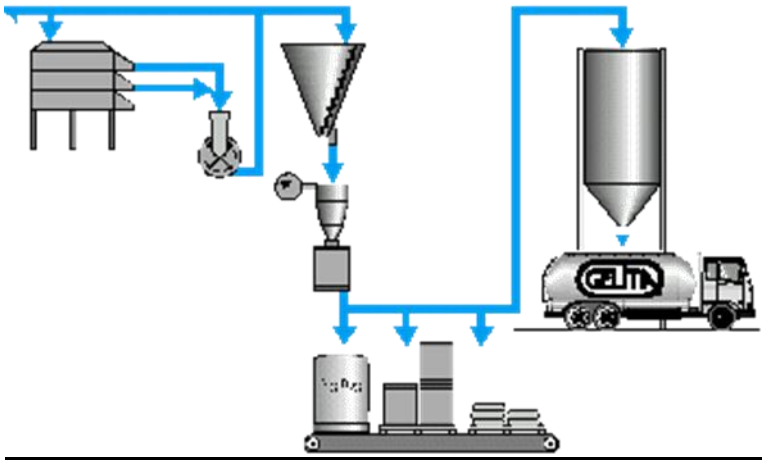
Figure 14: Concentration



Grinding, Sieving and Blending

These are final processes, but tahy also are very important steps in the chain that require pre-preparation of gelatin for specific customer requests or different applications. Due to these conditions, different grinders and blenders are used. After the silos are filled, final controls are made by the quality control laboratory and they are packaged in sacks, bags and boxes and sent to the customer.

Figure 15: Grinding, Sieving and Blending

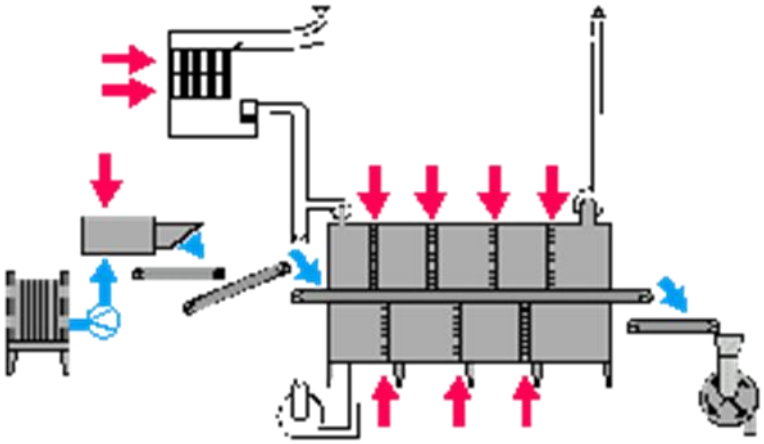


Drying

The highly concentrated gelatin solution is then rapidly subjected to a high temperature sterilization process, cooled and solidified as a re-sterilization process against potential hazards.

This process produces gelatin nodules evenly distributed over the dryer tray. There, the filtering, washing, pre-drying and the air preventing the germination dries the gelatin. To leave the desiccant, the hard and brittle gelatin is now shredded and ground to the same lump sizes. In this form, it is stored in the warehouse until the next operation is required. Before gelatin is used, chemical, physical and bacterial tests are performed.

Figure 16: Drying



- ***Technology Selection, Production Method and Material Balance***

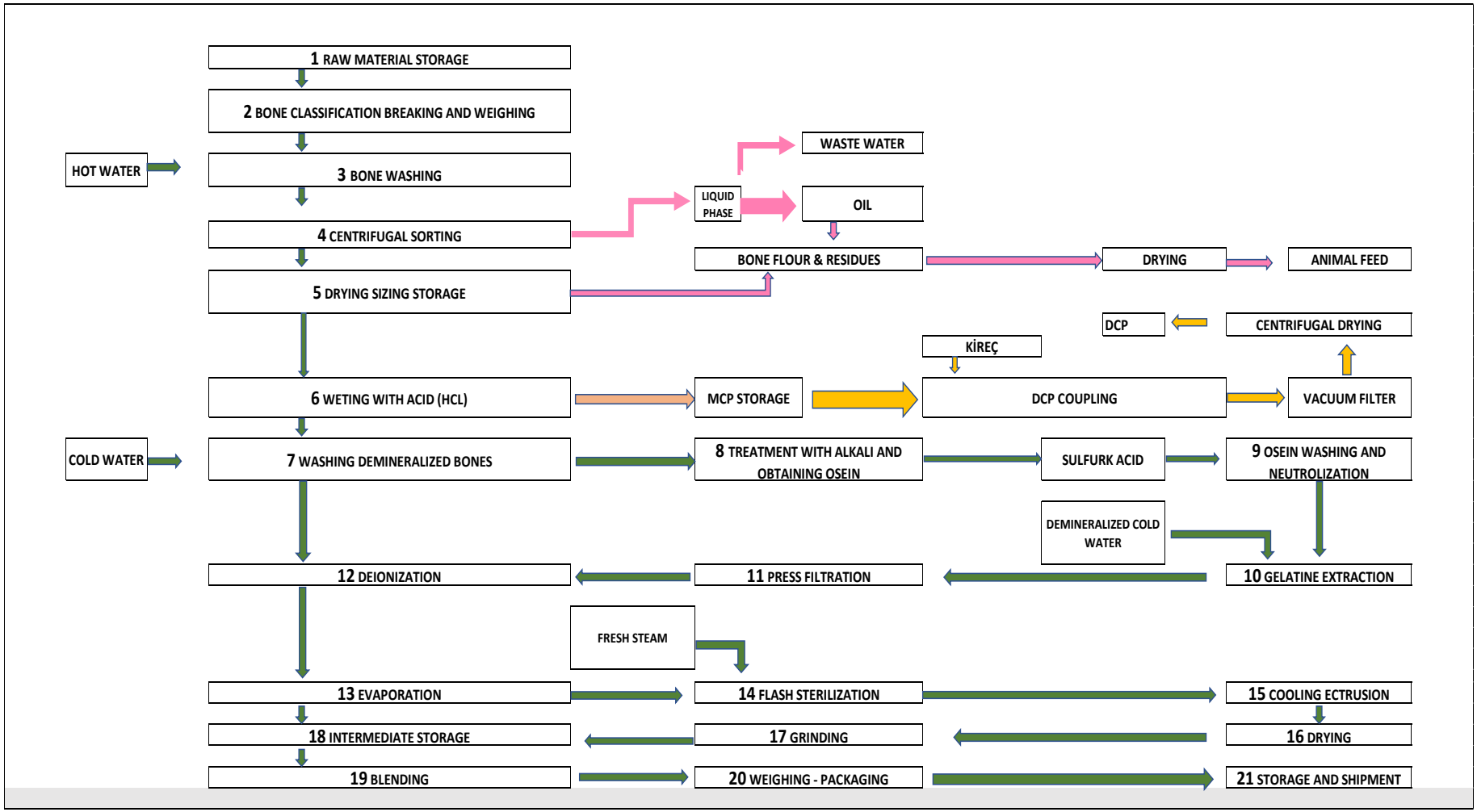
The Type B Alkali Production method foreseen for the facility is summarized below, and the flow chart for this is given in Figure 14. The item balance calculated according to the envisaged production method and flow chart is given in Table 23.

After the bones taken from the raw material warehouse (1) are classified, crushed and weighed (2), they are washed with hot water in a rotary bone washing machine to remove fat (3). By centrifugation, solid and liquid phases are separated (4). After separating the oils and water in the liquid phase obtained as by-products, the bone residues obtained are dried and used as animal feed. The main product, the crushed bones, are dried, sized and stored until certain sized batches are obtained (5) and then taken into acidification tanks (6). There, HCL reacts with minerals in the bones to form a by-product mono calcium phosphate (MCP). The MCP is obtained by treating with 15% lime milk and precipitating dicalcium phosphate (DCP). The concentration of 15% DCP in the solution obtained is first increased to 45% by vacuum. Then, 55% moisture in the solution is removed with a centrifugal flash dryer. On the other hand, demineralized bones, which are the main products, are first washed with cold water to remove excess HCL, then they are subjected to alkaline treatment with lime to obtain ossein, or bone extract (8). The production of ossein takes approximately 40-50 days.

Calcined ossein is first washed with cold water and purified from excess lime and then treated with sulfuric acid for approximately 2.5 days and neutralized to make its pH suitable for extraction (9). Gelatin is extracted by processing with hot demineralized water for approximately 16-20 hours and at different temperatures (40-80oC) in neutralized ossein extraction tanks (10). The 3-5% weak gelatin solution obtained is filtered through a press filter, and suspended impurities are removed and a clear solution is obtained (11). Filtered gelatin liquor is passed through ion exchangers to remove ash content and obtain a low conductivity liquor (12). Deionized gelatin liquor is passed through a triple-action evaporator and concentrated to 22-33% levels (13). The solution is sterilized by injecting fresh steam into the concentrated gelatin solution (14).

The sterile gelatin solution is fed to the votator (surface-scraped heat exchanger) system. There, gelatin, which is cooled to about 21oC and extruded at low temperatures, leaves the votator in stripes (15). Gelatin strips are fed into the belt dryer. There, by using dry and sterile air and generally increasing the temperature from 30oC to 50oC in eight steps, the humidity in gelatin is reduced from 25% to 10-12% (16). After the dried gelatin is ground to the desired particle size (17) and classified according to its size, it is taken into intermediate storage before blending (18). Products obtained in different batches are standardized by blending according to customer demands (19), automatically weighed and packaged in desired weights (20), then taken to the product warehouse until shipment (21).

Figure 17. Production Flow Chart



MCP MONOCALSIUM PHOSPHATE	
DCP DICALSIUM PHOSPHATE	SPIN-OFF
ANIMAL FEED	SPIN-OFF

Table 28. Material Balance for the Selected Production Method

PRODUCT OBTAINED IN THE PROCESS AND BY-PRODUCTS	*%*	*AMOUNT*
		TON / YEAR
INSTALLED CAPCCITY (GELATIN)		*1.500*
FRESH BONE	*100%*	*25.500*
BONE OIL FROM FRESH BONE	*5%*	*1.275*
DRIED BONE FRESH BONE	*35%*	*8.925*
BROKEN BONE FOR GELATINE FROM DRIED BONE	*94%*	*8.390*
BONE FLOUR FROM DRIED BONE AND OTHERS	*7%*	*625*
OSEİN	*28%*	*2.307*
DİKALSİYUM FOSFAT	*45%*	*3.775*
GELATINE FROM OSEİN	*65%*	*1.500*

- ***Facility Installed Capacity, Production Schedule and Projected CUR***

The total installed capacity of the facility is 300 days a year and 1,500 tons / year of powder gelatin production over 3 shifts / day. The determined installed capacities are theoretical, and the 300 days work has been taken into consideration considering the preparation and / or cleaning of machinery equipment for production, breakdown, repair and maintenance times, delay due to labor force, etc.

Bone oil, bone meal and dicalcium phosphate will be obtained as by-products at the plant. The amount of product to be obtained at full capacity is shown in the table above. It is thought that the most important parameter that will limit the production amount in the facility will be the raw material supply. Apart from this constraint, full capacity operation is envisaged with the necessary maintenance and repair measures and the provision of technical personnel.

Table 29. Main Processing Equipment From Fresh Bone To Bone Chips

Equipment
Screw Conveyor for fresh bone
Conveyor with Metal Detector
Di-shear 1st-stage bone crusher
Di-shear 2nd-stage bone crusher
Di-shear 3rd-stage crusher
Buffering tank
Screw conveyor
Raw material heater

Screw conveyor
Di-stage piston pusher centrifuge
Screw conveyor
Rotary drum dryer
Screw conveyor
Bucket elevator
Rotary sizing separator
Di-shear 4th-stage crusher
Belt conveyor
Horizontal screw settling centrifuge
Dryer for bone meal
Screw conveyor
High Speed disk centrifuge
High Speed disk centrifuge
Hot air furnace for bone chips dryer
Hot air furnace for bone meal dryer
Buffering tank
Buffering tank
Buffering tank with heating unit
Fat heating unit
Fat storage tank
Centrifuge pumps
Pumps for fat
Four-effect tube vacuum evaporator for evaporating the waste water from degreasing system

Table 30. Main Processing Equipment For Gelatine Process

Equipment
RO water heating system
Gelatin storage tank
Gelatine clarifying tank
Buffering tank
Storage tank for diluted gelatin tank in evaporating process
Storage tank for concentrated gelatine
Acid processing tanks
Liming pits
De-acid unit
De-liming unit
U type washing and neutralization system
Extraction system
Boiling extraction unit
Pulp press filter
Pulp cake washing and pressing system
Gelatine ion exchanging system
Bag filter
Ultra-filtration sytem
3-stage evaporation system
Sterilization system
Extruder
Continuous band dryer
Dehumidifier
Grinding machine
Mixing machine
Packing machine
CIP system

Table 31. Main Processing Equipment for By-Product DCP

Equipment
Neutralization unit
Sediment unit
Siphon centrifuge

Gravity pot
pneumatic dryer
Hot air furnace for the pneumatic dryer
Belt conveyor
Packing machine for DCP powder

3.1.3. Human Resources

With the commencement of the investment activities, it is envisaged that 153 blue and white collar employees will work at the facility. When the socio-economic development of Konya province, its proximity to Ankara and Antalya, its developed industry, the presence of more than one university, many vocational high schools, and as it can be seen in the table below, its young population over the average of Turkey are taken into consideration, providing the staff required will not be difficult. The distribution and organization chart of the foreseen 153 personnel are given below.

Table 32. Turkey and Konya Young Population

Year	Indicators	Turkey	Konya
2019	Total Population	83.154.997	2.232.374
	Age Range 15-24	12.955.672	373.837
	Age Range 15-64	50.060.331	1.486.190
	Rate of Young Population to Total	15,6	16,7
2018	Total Population	82.003.882	2.205.609
	Age Range 15-24	12.971.396	371.374
	Age Range 15-64	55.633.349	1.469.218
	Rate of Young Population to Total	15,8	16,8
2017	Total Population	80.810.525	2.180.149
	Age Range 15-24	12.983.097	373.014
	Age Range 15-64	54.881.652	1.454.330
	Rate of Young Population to Total	16,1	17,1
2016	Total Population	79.814.871	2.161.303
	Age Range 15-24	12.989.042	374.809
	Age Range 15-64	54.237.586	1.443.656
	Rate of Young Population to Total	16,3	17,3
2015	Total Population	78.741.053	2.130.544
	Age Range 15-24	12.899.667	370.091
	Age Range 15-64	53.359.594	1.417.650
	Rate of Young Population to Total	16,4	17,4

Source: TURKSTAT

Table 33: Age 15 and Over Population Rate by Education Level

Year	Indicators	Turkey	Konya
2019	Total Population	83.154.997	2.232.374
	Age Range 15-24	12.955.672	373.837
	Age Range 15-64	50.060.331	1.486.190
	Rate of Young Population to Total	15,6	16,7
2018	Total Population	82.003.882	2.205.609
	Age Range 15-24	12.971.396	371.374
	Age Range 15-64	55.633.349	1.469.218
	Rate of Young Population to Total	15,8	16,8
2017	Total Population	80.810.525	2.180.149
	Age Range 15-24	12.983.097	373.014
	Age Range 15-64	54.881.652	1.454.330
	Rate of Young Population to Total	16,1	17,1
2016	Total Population	79.814.871	2.161.303
	Age Range 15-24	12.989.042	374.809
	Age Range 15-64	54.237.586	1.443.656
	Rate of Young Population to Total	16,3	17,3
2015	Total Population	78.741.053	2.130.544
	Age Range 15-24	12.899.667	370.091
	Age Range 15-64	53.359.594	1.417.650
	Rate of Young Population to Total	16,4	17,4

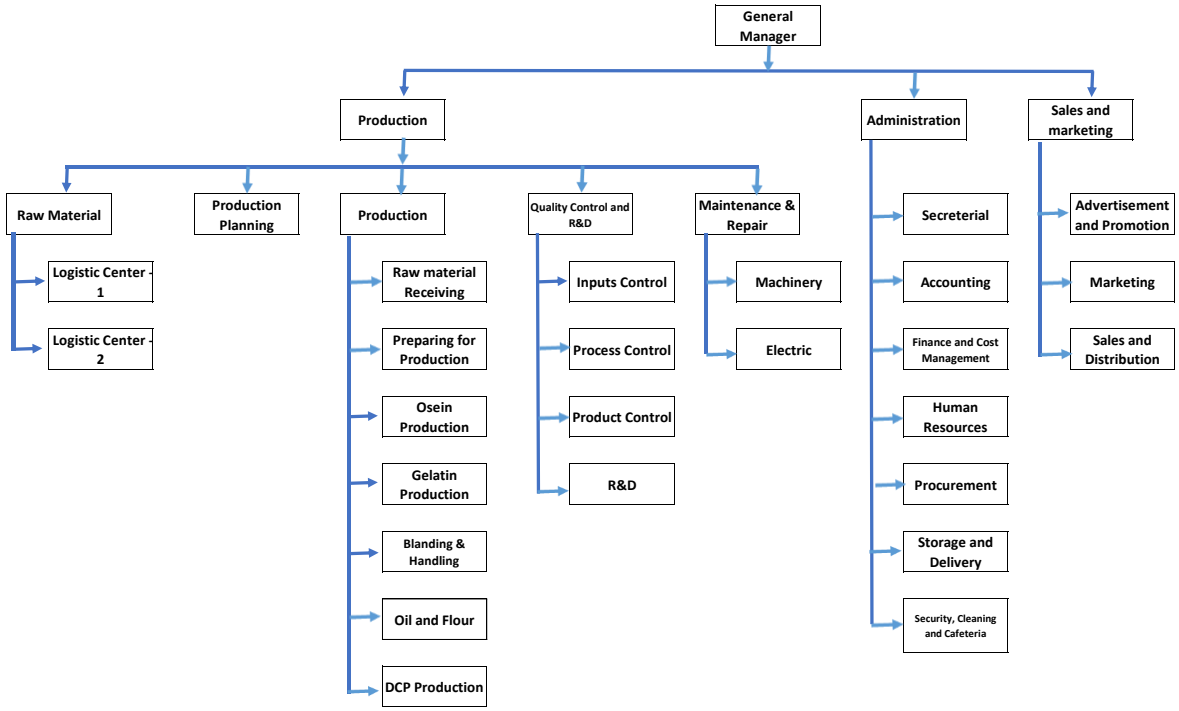
Source: TURKSTAT

Table 34. Labor and Staff Distribution

SECTIONS	TOTAL (NUMBER)	MANAGERS	ENGINEER	TECNITIONS/ LABORANT	OPER.	BLUE COLLARS	OFFICER
Factory	104	8	13	8	10	65	0
Production	8	8					
Shift Supervisor	3		3				
Production planning	2		2				
Row materials	21		2			19	
Osein Production	25		2		4	19	
Gelatine Production	25		2		4	19	
Packing	4					4	
Auxlary and Finished Products	6				2	4	
Quality Control and R&D	4		1	3			
Maintenance and repair	6		1	5			
Management	49	1	0	0	0	0	48
General Managenent	1	1					

Secretarial and Office Services	*2*						*2*
Accounting and Finance	*6*						*6*
Human Resources	*4*						*4*
Storage and Delivery	*12*						*12*
Cafeteria	*6*						*6*
Security	*6*						*6*
Drivers	*6*						*6*
Marketing, Advert and Sales	*6*						*6*
Total	*153*	*9*	*13*	*8*	*10*	*65*	*48*

Figure 18. Organization Chart



For the hinterland covering 12 provinces determined for raw material collection, 2 logistic centers and related personnel predictions were made. The number and location of hinterland and collection centers should be reviewed at the detailed feasibility stage.

Table 35. Monthly and Annual Salary Information (TL)

DEPARTMENTS	SALARIES			NUMBER	WORKING MONTHS	TOTAL YEARLY COSTS
	NET	GROSS	COST TO COMPANY			
General Manager	30.000	47.594	51.456	1	12	617.472
Production Manager	15.000	24.229	28.075	1	12	336.900
Chief of Production	8.000	12.436	14.613	1	12	175.356
Chief of Quality Control	8.000	12.436	14.613	1	12	175.356
Chief of Maintenance and Repair (Mechanical Engineer)	8.000	12.436	14.613	1	12	175.356
Engineers	7.000	10.805	12.696	13	12	1.980.576
Technition / Laborant	5.000	7.542	8.862	8	12	850.752
Operators	4.000	5.910	6.945	10	12	833.400
Blue Collars	2.500	3.582	4.208	65	12	3.282.240
Administrative and Financial Affairs Manager	9.000	14.068	16.530	1	12	198.360
Accounting and Finance Chief	8.000	12.436	14.613	1	12	175.356
Human Resources	4.000	5.910	6.945	4	12	333.360
Purchasing and Warehouse Attendant	4.000	5.910	6.945	12	12	1.000.080
Secretarial and Office Services	3.500	5.095	5.986	2	12	143.664
Purchasing manager	8.000	12.436	14.613	1	12	175.356
Driver	3.500	5.095	5.986	6	12	430.992
Cafeteria Attendant	2.500	3.582	4.208	6	12	302.976
Security Guard	2.500	3.582	4.208	6	12	302.976
Accounting and Finance	2.500	3.582	4.208	6	12	302.976
Sales and Marketing Manager	9.000	14.068	16.530	1	12	198.360
Advertising and Sales Officer	4.000	5.910	6.945	2	12	166.680
Marketing Staff	3.000	4.325	5.082	4	12	243.936
TOTAL (TL)				153		12.402.480
TOTAL (USD)						1.809.524

4. FINANCIAL ANALYSIS

4.1 Fixed Investment Amount

Table 36. Total Investment Amount (USD)

Investment Items	2021		2022		TOTAL		
	INTERNAL	EXTERNAL	INTERNAL	EXTERNAL	INTERNAL	EXTERNAL	TOTAL
A- FIXED INVESTMENTS	4.884.522	6.402.348	2.546.944	4.268.232	7.431.466	10.670.580	18.102.04
1- LAND	145.900				145.900	0	145.900
2- RESEARCH AND DESIGN WORK	200.000				200.000	0	200.000
3- TECHNICAL ASSISTANCE-LICENSE	0				0	0	0
4- CONSTRUCTION COSTS	4.243.000		1.060.750		5.303.750	0	5.303.750
5- MACHINERY AND EQUIPMENT		6.402.348		4.268.232	0	10.670.580	10.670.58
6- FRIGHT AND INSURANCE	138.705		554.883		693.588	0	693.588
7- CUSTOM EXPENSE					0	0	0
8- FITTING	110.000		110.000		220.000	0	220.000
9- VEHICLES & FIXTURES			454.654		454.654	0	454.654
10- STARTUP EXPENSES			200.000		200.000	0	200.000
11- GENERAL EXPENSES	46.917		23.803		70.720	0	70.720
12- CONTINGENCIES			142.854		142.854	0	142.854
B- WORKING CAPITAL INVESTMENTS	0	0	2.165.195	0	2.165.195	0	2.165.195
TOTAL INVESTMENT COSTS	4.884.522	6.402.348	4.712.139	4.268.232	9.596.661	10.670.580	20.267.24
RECOVERABLE VALUE ADDED TAX	852.952	0	350.898	0	1.203.850	0	1.203.850

4.1.1. Land Investment

The establishment of the facility is planned on a 50,000 m² land. Due to the excessive amount of water used in gelatin production and the negative effects of waste water generated after production, some criteria were taken into account in the selection of the land to be determined for investment. First of all, the zoning status, water, energy, natural gas and purification properties were taken into consideration. Land status and organized industrial zones of Konya and its districts have been taken into consideration. In the meetings with Konya Organized Industrial Zones Directorate which are in the city centre, it was stated that there is no land that can be allocated (while the report is preparing period). In the meetings made with the Organized Industry Directorate of Beyşehir, one of the ***districts of Konya, it was learned that the second organized industrial zone would be opened in about seven months and a land could be found for 20 TL / m².***

Within the scope of this information, the price of a 50,000 m^2 land is 50,000 m^2 x 20 TL / m^2 = 1,000,000 TL (145,900 USD).

4.1.2. Survey and Project Expenses

The number of companies in the world that can produce all the necessary machinery and equipment for gelatin facilities and establish turnkey facilities is limited. On the other hand, although the production of gelatin seems easy, since it is not a known technology, it will be a very difficult process to produce gelatin in the desired quality and in accordance with customer demand and to design a production facility accordingly.

On the other hand, Incentive Certificate required to be obtained during the investment period, environmental permits (the investment is not within the scope of EIA but within the scope of Environmental Permit and License Regulation of the Environment Law), business licenses, necessary laboratory analyzes, brand registrations, HACCP (FOOD SAFETY MANAGEMENT SYSTEM CERTIFICATE) - Quality and / or product conformity certifications such as ISO, TSE, Halal Food Certificate are also taken into account in this item. In this context, a total expenditure of 200,000 USD is foreseen for survey and project services and engineering services.

4.1.3. Construction Expenses

A land of 50,000 m^2 is required for the facility and 25,000 m^2 of closed construction area is required for a production capacity of 1,500 tons of gelatin. According to the Ministry of Public Works' approximate unit cost classification for buildings, integrated agricultural industry structures are in Class III Group B. Accordingly, the unit cost in the construction cost calculation of the facility was taken as 1,450 TL / m^2 (211.55 USD / m^2).

For a capacity of 1,500 tons;
25,000 m^2 X 211.55 USD = 5,288,750 USD

Due to the use of too much water in production, it is envisaged to drill a well within the factory site. Provisions regarding research, extraction and use of water should be applied to meet the conditions specified in DSI UNDERGROUND WATER TECHNICAL REGULATION for exploration and extraction of underground water resources to open the well. In calculating the cost of the well, the unit prices of TMMOB Geophysical Engineers Chamber 2020 were taken as a basis. It is predicted that water can be removed from approximately 150 meters in the field. Approximately 100,000 TL (15,000 USD) is expected to be spent. Total construction cost is 5,303,750 USD.

4.1.4. Machinery and Equipment Expense

The list and prices of necessary machinery and equipment for the facility are given in the Annex for a capacity of 1,500 tons. The main machinery and equipment amount defined based on the offer

received from Nantog Keda Chemical Machinery (http://www.snsjzy.com/eims/plus/list.php?tid=5), one of the largest machinery manufacturers in this sector and able to offer complete turnkey offer, is 10,670,580 USD on turnkey basis including treatment. Detailed machinery equipment list is given in the attachment.

4.1.5. Transportation and Insurance Expenses

Main machinery and equipment will be imported from abroad. 5% of FOB price is taken for transportation by ship and insurance and 1.5% for domestic transportation of main machinery and auxiliary units machinery equipment.

4.1.6. Import and Customs Expenses

Since the investment is planned to be made with an incentive certificate, imported machinery and equipment will be exempt from customs duty and no expenditure is envisaged for this item.

4.1.7. Installation Expenses

USD 220,000 is foreseen as an expense for the installer services to be provided by the manufacturer for the assembly of the main machinery and equipment, and for the installer services for auxiliary machinery and equipment.

4.1.8. Vehicles and Fixtures Expenses

For vehicles, a total of USD 354,654 is foresee for one automobile (300,000 TL), two midibus type (580,000 TL) for general purpose use such as worker-material transport, etc., one flatbed van type commercial vehicle (180,000 TL), two 20-ton capacity frigofrig trucks (200,000 USD) for raw material transportation.

On the other hand, the necessary fixtures such as office materials and devices for the facility, etc. (telephone switchboard and devices, computer and softwares, fax, photocopy machine, air conditioner, tables, armchairs, cabinets, etc.), were estimated as USD 100,000. In this case, a total of 454,654 USD has been foreseen for vehicle and fixtures expenses.

4.1.9. Start-up Expenses

Commissioning expenses covering the expenses that may arise during the control phase of the operation of the installed machinery and equipment; for expenses such as energy to be used, material and labor in stages such as testing, setting and trial production are estimated as USD 200,000.

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4.1.10. General Expenses

Approximately 1% of the fixed investment amount (up to there) has been taken as communication, announcement, travel and similar expenses of the investment period and personnel and general management expenses of the investment period.

4.1.11. Contingencies

It is estimated that there may be a physical and financial unexpected expense of approximately 2% of the expenses up to this item.

Table 37. Investment Implementation Plan

INVESTMENT ITEMS	1. YEAR								2. YEAR											
	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
LAND																				
PROJECTS																				
CONSTRUCTION																				
MACHINERY & EQUIPMENT																				
TRANSPORT & INSUARENCE																				
ASSEMBLY																				
VEHICLES & FIXTURES																				
STARTUP																				

The investment implementation program, which has been prepared in terms of main investment items, taking into account the above-mentioned transactions, has been given. Accordingly, it is predicted that the investment process can be completed and the facility can be put into operation in about 20 months.

4.2 Return on Investment

The return on investment is calculated as 4 years and 10 months. Due to the sensitivity of the production and the market in gelatine production, an appointment could not be obtained with the manufacturers.

5. ENVIRONMENTAL AND SOCIAL IMPACT ANALYSIS

The investment is not within the scope of EIA, but is under the Environmental Permit and License Regulation of the Environment Law. In case of necessity to drill a well, necessary permissions should be obtained and the periods of obtaining these permissions should be taken into consideration in detailed feasibility studies.

Investment has the ability to provide added value due to the employment it will provide. In addition, considering the intensity of confectionery and food industry in neighboring provinces, especially Konya, it will also support the raw material input of this sector.

In addition, if the investment is realized in Beyşehir OIZ, which is about to be completed, it is expected that both the interest in the OIZ will increase and the commercial life of the city will be activated.

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ITC (International Trade Center)

TURKSTAT (Turkish Statistical Institution)

TOBB (Turkey Union of Chambers and Commodity) Industry Data

Preparation and Processing of Religious and Cultural Foods

http://ggbs.tarim.gov.tr/cis/servlet/StartCISPage?PAGEURL=/FSIS/ggbs.onayliIsletmeSorgu.html&POPUPTITLE=AnaMenu

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