STORAGE IS THE KEY

GANTEK

Foundation for Science, Culture & Education

storage is the key

Cantek Foundation for Science, Culture and Education

Concept / Director	Can Hakan Karaca
Scientific Advisor	Professor Dr. Rahmi Türk
Author / Editor	Tamer Utku
Graphic	Semiha İdil
Photo	Ali Fakıoğlu, Attila Özçay
Translation	Zeycan Hacısarıoğlu
Printing house	Metro Ltd. Şti. / İzmir

Contact +90 242 258 17 00
info@cantekvakfi.org

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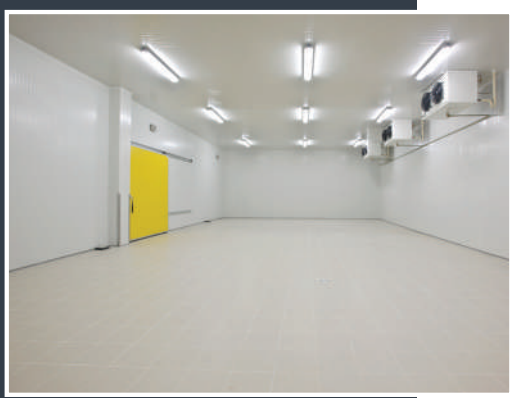
Prof Dr. Mustafa Erkan, Prof. Dr. Kenan Kaynaş, Zym. Bülent User, Prof Dr. Ayhan Topuz, Prof. Dr. Yılmaz Eren, Dr. Tanju İpek, Derya İkad, Prof. Dr. Hasan Çelik, Prof Dr. Sabit Ağaoğlu, Prof D. İlhami Köksal, Prof. Dr. Ömür Dündar, Prof Dr. Nurdan Tuna Güneş, Dr. Arif Atak, Zym. Yılmaz Boz, Şükrü Erdem, Prof Dr. Muharrem Özcan, Prof Dr. Elif Çandır, İlhami Tozcu, Orçun Dalkılıç, Denise Dinçsoy, Beşir Çetin, Kaan Tezcan, Kayıhan Özkan, Onur Akça, Emre Dank, Naim Akkaya, Turgut Görener, Fatih Göçen, Kurtuluş Sözmen

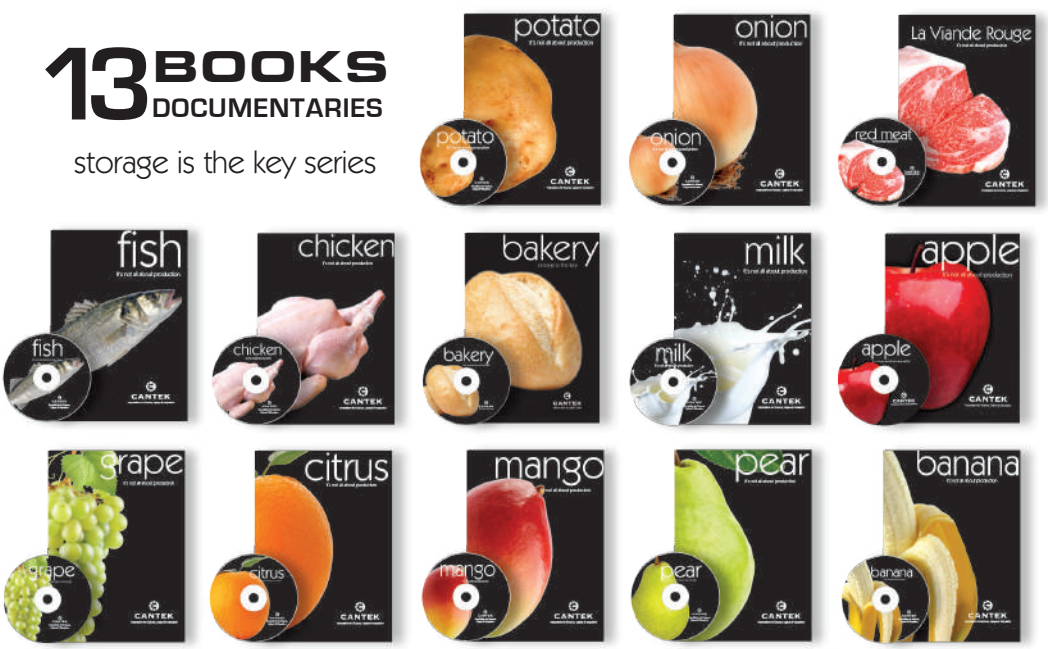


Although storing food in cold storage seems simple, storage method of each product has plenty of specific techniques and details. While developed countries with high volumes of production and consumption are highly competent at these details, research shows that there is still a lack of knowledge on food storage.

Cantek Science, Culture & Education Foundation aims to raise awareness on the storage methods of the 13 most consumed foods in the world through a series of books and documentary films and contribute to the world economy by storing food with appropriate and good techniques…

13 BOOKS
DOCUMENTARIES

storage is the key series



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Can Hakan KARACA

Storage is the key

Having completed our 25 years in this industry, we founded the CANTEK Science, Culture & Education Foundation in order to share our knowledge, and bring this knowledge into the service of mankind.

The two biggest threats facing human population, which has doubled during the last 50 years and projected to exceed 12 billion in 2050, are the food and energy supply issues. Having been fully aware of this problem, we asked this question:

"Can production alone solve the food problem?"

Big majority of global food go wasted after harvest or production due to lack of knowledge and technologies. When we noticed that the amount of global food losses were equivalent to feed the entire Africa continent, we embarked upon this project, as we would not just become mere spectators.

Our foundation is now making books and documentaries of the 13 most consumed foods in the world. This book has been prepared to inform about the world's most advanced storage methods and promote our documentary films and books.

We aim to contribute to the world food problem by raising awareness through our books and documentaries, which will be made in Turkish, English, French, Spanish, Arabic and Russian.

Can Hakan KARACA
President of CANTEK Science,
Culture & Education Foundation

Earth,

is the only planet known to have life in the universe.

Its population is growing rapidly,

and along with this growth, the need for food will rise, highlighting the importance of agriculture. Regardless of the development levels of countries, agriculture is a dynamic and indispensable industry.

Production is one and only way to progress, however, production alone does not suffice.

Large quantities of food produce are wasted before reaching the consumer.

The existence of human race goes back to merely 200 thousands years ago on our 5-billion- year-old planet. Human race is undoubtedly the most invasive and skilful species ever, dominating the world using its talents.

Following the first and second world wars, which were started due to the desire to achieve domination and rule, the global population was only 3 billion in 1960. In 2020, the world's population reached 7.7 billion with people relieving from stress and tension.According to a UN report, the current world population is expected to reach over 10 billion only in just 35 years.

Taking these data into account, food production will have to rise by 50 % by 2050 to meet the projected demand of a growing population. Therefore, we should have serious concerns about this issue and devise major plans.

The two biggest threats awaiting humans, doubled in population in just 50 years and projected to rise by five-fold in the near future, are the issues of energy and food supply.


Population growth by years
3 BILLIONS
1960
5 BILLIONS
1987
7,7 BILLIONS
2020
10 BILLIONS
2050

Fruit Storage

Meat or Fruit Storage

Cold storage with poor conditions

So, can we solve the food problem by merely producing food?

People reach food in three stages.

- First stage is when food is produced.
- Second stage is when food is produced and stored.
- Third stage is when food is produced environmentally friendly and efficiently, and stored with the best technology.

Food production has now become easier through new technologies and knowledge. However, storing food properly is still a major problem. The oldest methods of storing food, cooling and freezing, are still the healthiest and most commonly used methods.

Best cold storage systems, manufactured particularly in countries producing and consuming large quantities of food, are unfortunately unknown to 80% of the food producing countries. In other words, 80% of the world's food cannot be stored under the best circumstances. Even the most developed countries do not have all the best food storing technologies,

and this is a major problem...

Food producers, whose products cannot be stored properly, are unable to make sufficient profits and therefore improve their business. This vicious cycle contributes only to polluting our planet with no apparent reasons without ever knowing how and why it happens.

Cantek Group devotes its knowledge and experience accumulated through 25 years to humanity through its Science, Culture & Education Foundation.

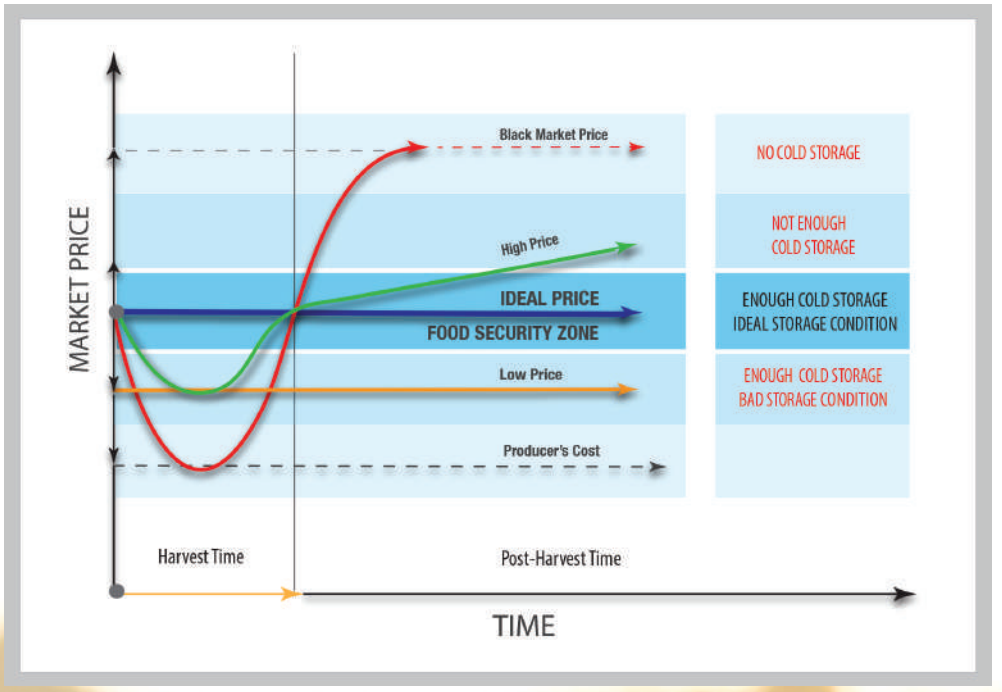
And for this reason, Cantek describes the processes of 13 essential and world's most traded foods from production to consumption with books and documentary films.

The foundation aims to teach how to store these foods in the best possible way raising awareness on this issue and preventing food loss.

If we wish to achieve world peace, we must use our energy efficiently and solve the food problem immediately. We must ensure a better future by using our food and energy properly.

The biggest threat facing our world is to believe that "others" will save the world.

THE THEOREM OF FOOD PRICE - STORAGE EFFECT



80% of the food produced worldwide cannot be stored or loses its value due to poor storage conditions.

That is why production is not enough

POTATO

Originated in South America, potato was introduced to Europe by the Spanish conquistadors in 1535. Although the church had not approved its consumption for a while, thanks to a wise priest, its bad reputation was restored and first planted in France and Italy. Having then spread to Asia and Africa, potatoes have now become a popular vegetable in every kitchen.

Nearly half of potato consumption around the world is fresh, while the other half is used as processed food products, animal feed, industrial starch, and saved for planting. Frozen potato chips can be kept for a long time and star on fast-food restaurant menus spread all around the world.

With a total production of over 300 million tonnes, potatoes grow in many countries in order to meet high demands.

China is the leading producer of potatoes outscoring other countries with a production of 75 million tonnes. India is the second biggest producer with 37 million tonnes of production followed by Russia with 22 million tonnes.

WORLD POTATO PRODUCTION IS ABOUT 300 MILLION OF TONNES

LEADERS OF POTATO PRODUCING COUNTRIES

1 CHINA	2 INDIA	3 RUSSIA
75 million tonnes	37 million tonnes	22 million tonnes

Between 70-80% of raw potato is composed of water and 20% of it contains carbohydrates, and packed with various minerals and vitamins, needed for a healthy diet. After grains, potatoes are the most popular food in plant-based diets. Potato is produced and consumed in almost every country in the world thanks to its low price, high yields per unit area, rich nutrients, easy digestion, wide range of use and being easy to grow almost in any climate.

Its tubers are packed with plenty of carbohydrates as starch, potassium, iron, vitamins B and C.

Staple food for Europe and Americas is potato, while rice is preferred as major staple in the Far East and wheat in Asia and Africa. However, potato cultivation has now begun increasing in the Far East and Africa.

Potato, by its very nature, is suitable for long-term storage. Although it is still stored in primitive storage and caves, these methods lead to spoilage.

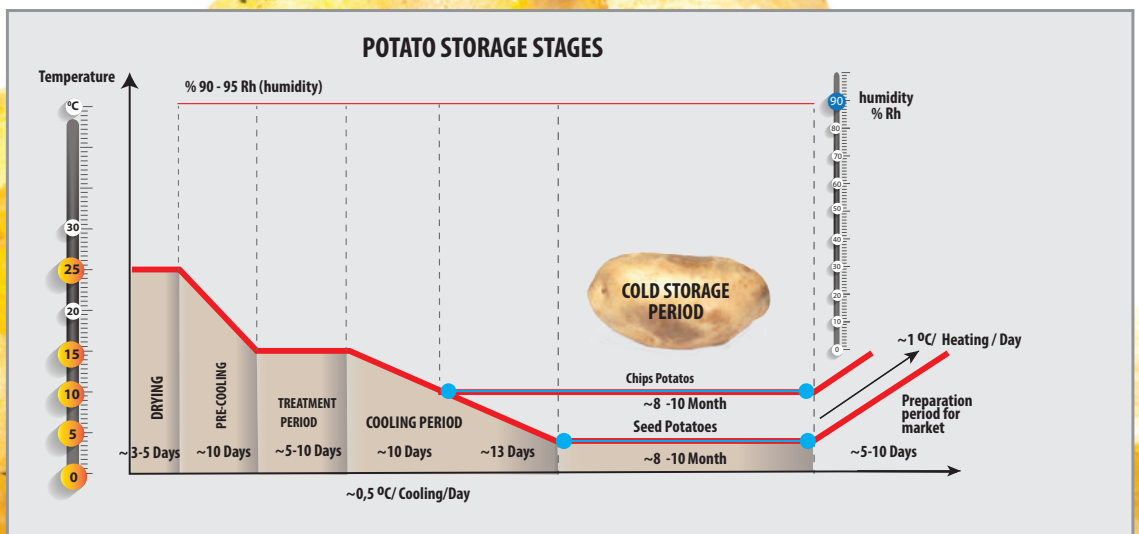
Seed potatoes need to be stored differently as other potatoes are put through a chemical process in order to avoid germination while storing.

Preserving potatoes are similar to onions, as all root plants need to be dried before they are put in storage. After drying, potatoes bruised during the harvest or handling, are cured in order to prevent rotting and help healing of the cut skin.

After this stage, potatoes are prepared for cold storage by lowering temperature at 0.5 °C per day. Seed potatoes are best stored in cold store maintained at 2-4°C while other types at 4-10°C. However, controlling carbon dioxide is also important as much as heat and humidity control in cold storage. Increasing the level of carbon dioxide should be controlled and kept within certain limits. To prevent condensation, potatoes should be prepared by increasing the temperature at 1°C, before they are taken out of the storage to be put on the market.

The best method of storing potatoes is the modern storage technique that includes the stages of drying, curing, cooling, storing and preparing for the market. It is estimated that only 50 million tonnes of the 300 million tonnes of global potato production are kept with this kind of storage method.

Having been a revolutionary food for the past 500 years, potato is an amazingly popular vegetable that has become a strategic and staple food for humanity.



ONION

Although archaeologists, botanists and food historians provide different information on the origins of onion and where it was first cultivated, they all agree on the fact that it first existed in Asia and spread from there to the world. Having been cultivated for 5 thousands years, onion has been crowning our salads and meals along with its countless health benefits and strong aroma.

Apart from its use in construction, the shape of onion inspired many structures from shrines to domes.

After Ancient Romans discovered onion, they used it regularly in their kitchens, influencing the culinary culture of the West. With the exploration of the Americas, onion was introduced to the New World and became a very popular root vegetable.

Onion is the oldest and most widely used vegetable that can be cultivated in all types of soil all around the world. Being an irreplaceable aroma for the meals, onion creates a large economy with a production of almost 100 million tonnes around the world.

WORLD ONION PRODUCTION IS ABOUT 100 MILLION OF TONNES

LEADERS OF ONION PRODUCING COUNTRIES

1 CHINA	2 INDIA	3 USA	4 IRAN	5 RUSSIA	6 TURKIYE
22,3 million tonnes	19 million tonnes	3 million tonnes	2,3 million tonnes	2 million tonnes	1,9 million tonnes

The United Nations reports that onion is grown at least in 175 countries, and this figure doubles the number of wheat growing countries.

Asia is the largest producer of onion with a market share of 65%, while Americas, Europe and Africa each has just over 10% of market share. China is the leader of onion production with 23 million tonnes in Asia, and followed by India with a production of over 19 million tonnes. China and India are followed by the United States with a production of over 3 million tonnes. Other large onion producers are respectively Iran, Turkey, Pakistan, Egypt, Brazil and Mexico.

Although Asia has the biggest share in terms of production area and quantity, it does not rank as the leading market in global onion market.This is due to high population density, insufficient storing spaces and the fact that they can't come out to foreign markets.

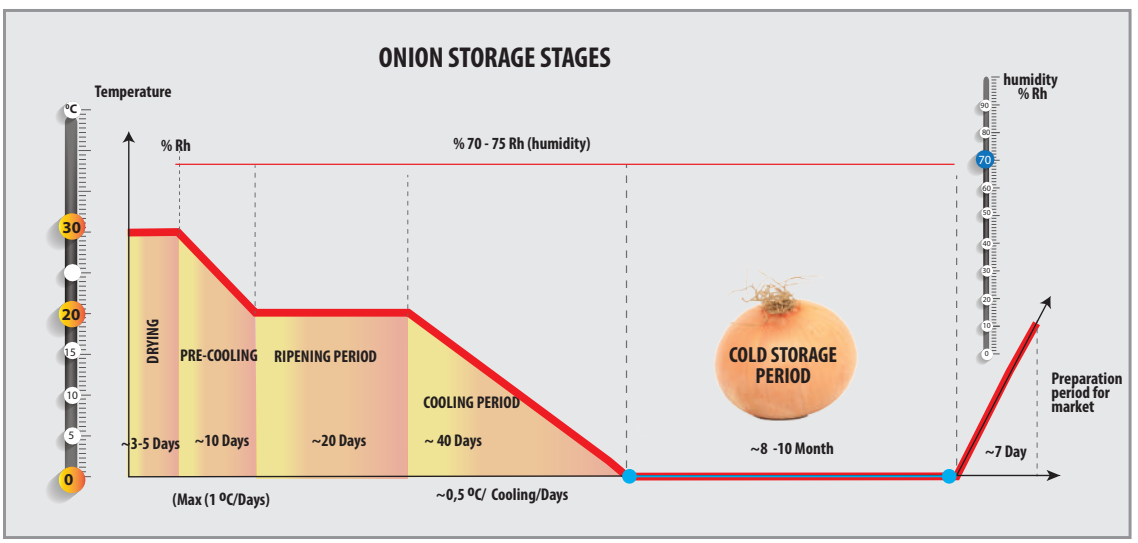
While countries aim to increase their production for their citizens, they try to sell their surplus products on global markets for economic growth. If new investors prefer yellow onions considering the demands of developed countries' markets, they should know that they would have a large market share.

Nearly 90% of onions are consumed within the country they are grown; therefore, onion does not stand out in many parts of the world although there are hardly any meals in which onion is not used. It has a sought-after aroma for salads, meat, fish, chicken and vegetable meals along with its countless health benefits. Also, onion by-products such as onion crisps and onion rings have begun to be produced recently.

With its low calorie and fat content, onion is a rich source of nutrients such as sulphur, fibre, vitamins B and C. Moreover, the fact that it is now widely used in alternative medicine and has antiseptic and antioxidant properties make this vegetable even more significant.

ONION STORAGE

Traditional method of storing onions is drying them with their stalks on and storing in a cool cellar, cave or a dark storage after they are harvested until they are consumed.



However, between 40-80% of the onions stored with this method result in spoilage. Neither economy nor our aged planet can afford these kinds of spoilage anymore. Onions now are stored in cold storage after the harvest. First, onions need to be dried for a few days. Then starts the maturing stage that enables skin and colour formation specific to the onion cultivar.

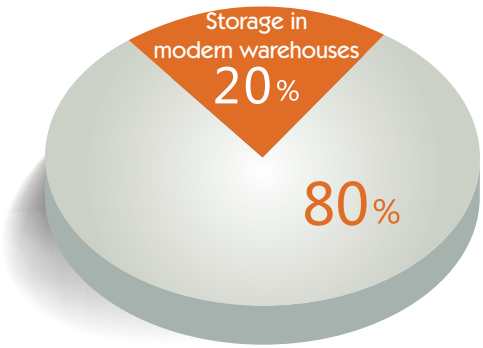
Onions are prepared for cold storage by lowering the temperature at maximum 0.5 °C per day. Depending on the onion variety, they are stored at between 0 °C and 2 °C in cold storage. Onions can be stored in cold storage up to ten months without spoilage.

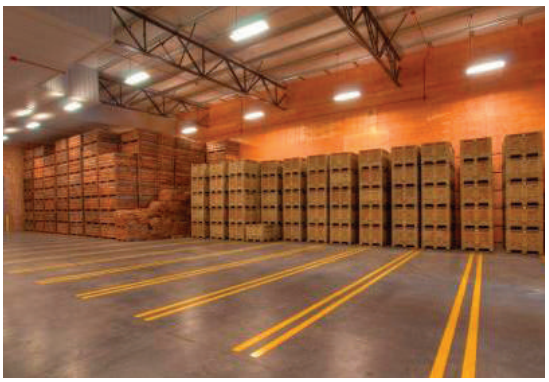
Ventilation is vital in onion storage. After storing, onions are not transported straight from the cold storage before they are put on the market, but heated in temperature-controlled conditions in order to prevent condensation.

Isn't it interesting?

It's a little difficult and elaborate process, but worth it.

However, only 20 million tonnes of global onion production of 100 million tonnes are stored with modern storage methods and spoilage still continues.





Wooden cases used for onion storage

Air canals for storing onions in bulks

Net bags

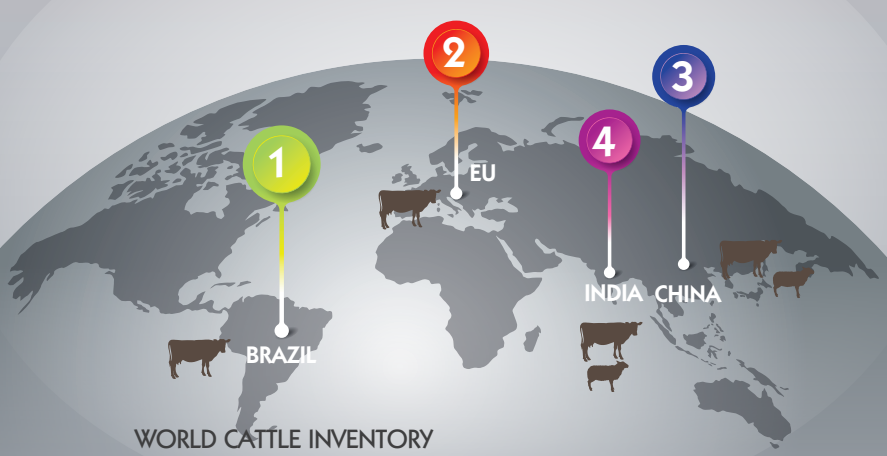
RED MEAT

It is well known that humans have been hunting animals in order to feed themselves since the early ages. Therefore, meat is one of the earliest nutritional sources for humans.

Archaeological evidence shows that domestication of various plants and animals began in six different regions around the world with the earliest settlements of humans 7 to 10 thousands years ago.

The main target of this revolutionary change, which first began in the tropical and sub-tropical belts of Southeast Asia, South Asia, North and Central Africa and Central America, is to improve agriculture and benefit from the animals' milk, meat, wool and skin more efficiently.

World cattle inventory	1,3 billion head
World sheep inventory	1,2 billion head
World goat inventory	1 billion head



WORLD CATTLE INVENTORY

1 BRAZIL	2 EU	3 CHINA	4 INDIA
9,5 million tonnes	7,5 million tonnes	6,5 million tonnes	4 million tonnes

INDIA AND CHINA ARE THE LEADERS IN WORLD SMALL CATTLE INVENTORY

The most important milestone of raising livestock that continued for thousands of years was to raise livestock in enclosed areas in order to provide faster and tastier meat from animals, and developing animal feed. Additional to clover, corn, barley, wheat and soya, oilseed residues, molasses and intensive fattening feed, made the price of meat affordable therefore increased the meat consumption.

World cattle inventory today is 1,3 billion head. India and Brazil own approximately 30% of the total world cattle inventory. The European Union, China, the United States and East Africa known as the Horn of Africa are the other big cattle breeding countries.

World sheep inventory today is 1,2 billion head, and world goat inventory has reached 1 billion head. China and India are the leading countries on the world small cattle inventory.

Global meat demand is increasing, however, the increase in meat consumption varies greatly between countries.

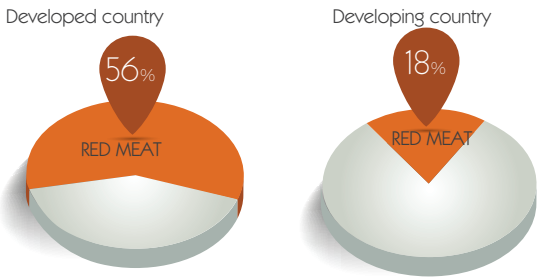
Meat consumption is increasing slowly, as a matter of fact, almost came to a deadlock in Europe and United States, which are the biggest meat producers of the 20th century.

The biggest demand for meat in the world comes from the rapidly growing middle class in India and China.

While meat is an affordable product in the developed markets, it is luxury food in countries with poor livestock infrastructure and can only appear on the menus of special dinners. Researches reveal that the demand for animal protein increases based on the increase in the level of income, because consuming meat is a status symbol for those with better incomes.

However, consuming meat is still almost luxury for many people in developing countries. The gap between the developed and developing countries reveals itself in meat consumption.

Rates of meeting protein needs from meat in developing countries



While people meet the 56% of their protein needs from animal products, this rate is only 18% in developing countries.

The most important part of meat processing is slaughterhouses where meat is prepared for the industrial use.

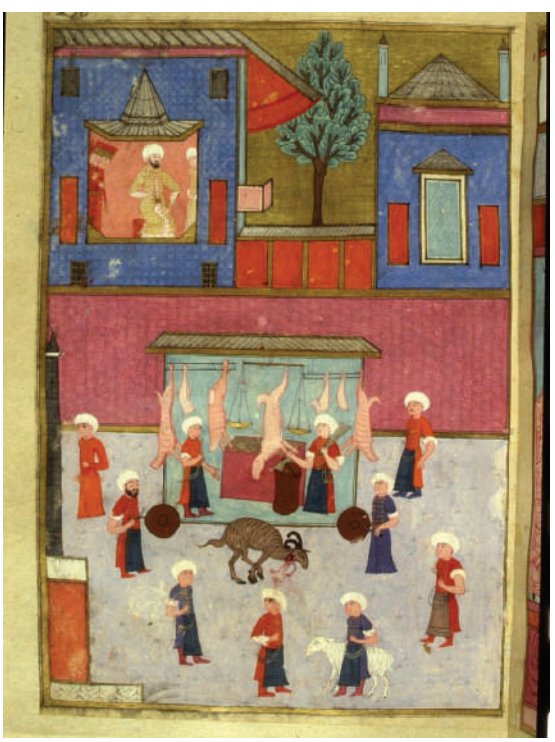
The Uyghurs established the earliest slaughterhouses in history and their traditions were continued and developed during the Seljuk Dynasty after the adoption of Islam in the following periods.

The earliest examples of modern slaughterhouses were built in the 10th century during the Seljuk Dynasty by the butchers' guild. Butchers slaughtered animals in open-air public spaces covered on the sides. These slaughterhouses performed halal methods of slaughtering according to Islamic rules and paid strict attention to hygiene. Meat, offal and leather traders had their shops outside the city walls and inspected by the butchers' guilds.

During the Ottoman periods, the same tradition was maintained with the improvement of hygienic measures to preserve meat from bacteria and manage the waste, particularly while meeting the meat needs of the palace. The first slaughterhouse in Istanbul was built in 1453 with the order of the Sultan Mehmet the Second after the city was conquered by the Ottomans. Slaughtering animals publicly on the streets was banned by an imperial order, and certain places were assigned to public slaughterhouses.

And transporting and delivery of the meat after the slaughtering was regulated.

Since butchery is a very difficult and messy profession by its nature, it was performed by the lowest class, and took a while until it was improved. Butchers were infamous people involved in bullyragging and fights, and people refrained from them. By the same imperial decree of the Mehmet the Second, butchers were employed as gardeners during six months for their psychological fitness.



The first slaughterhouse in the United States was established in 1640 in the state of Connecticut.

Although the Europeans learned the system of slaughterhouses from the Ottomans, slaughterhouses had not been established until the 1800s in Europe. The first statesman who understood the importance of slaughterhouses in terms of health and safety reasons was Napoléon Bonaparte. The first slaughterhouse in Paris was built in 1807 under the order of Napoléon. Following that, modern slaughterhouses became widespread in Europe, Far East and Sub-Saharan Africa.

After the Second World War, cold storage began to be used in slaughterhouses and accessing healthier and more affordable meat became possible.

Recommended daily protein intake is 55 grams for an adult man and 45 grams for an adult woman. Growing children need more animal protein.

High levels of proteins and essential amino acids contained in meat cannot be produced in human body; therefore it is important to take them through diet. Also, meat is considered as the main source of zinc, magnesium, iron, phosphor and cobalt, which are necessary minerals for human body. Particularly iron contained in meat is the form of iron most easily absorbed by the body. So, meat consumption is advised to people with anaemia. Meat and meat products are good sources of vitamin B complex of thiamine, riboflavin, niacin, biotin, B6, B12, Pantothenic acid and folacine.

SLAUGHTERHOUSES

Meat processing in halal slaughterhouses is as following: First of all, animals transported over various distances are gathered in waiting spaces called paddock that can be arranged depending on the number of animals.

In order to obtain quality meat, it is suggested that the stress level of animals should be reduced. Therefore, they need to be kept in paddocks at least one day and prepared for the slaughtering.

After waiting in paddocks, cattle are taken to slaughter floor. Animals are turned towards Mecca and slaughtered in knocking box preceded by the words “In the name of Allah (Bismillah)”, and then the blood is drained from the animal. First the feet and horns are cut off. Internal organs are removed after the skinning, and the carcass is broken down.

Paddock

Animal slaughtering box

De-Hiding

Offal evisceration

Carcass splitting

Following the veterinary control, cleaning, trimming and weighing processes, the meet is taken to precooling and then to cold storage until its dispatch. It does not take more than 20 minutes from the slaughtering of the animal to moving to cold storage.

Small cattle are taken to slaughtering floor after waiting in paddocks. They are turned towards Mecca, slaughtered reciting "Bismillah" and their blood is drained from the body. The slaughtered animal is skinned and then internal organs are removed. Pre-cooling follows veterinary control, general cleaning, trimming and weighing and then the meat is taken to cold storage.

Along with slaughtering animals according to Islamic and health rules, storing them with the right technology is the most vital issue of the modern slaughterhouses.

Meat is easier to store and process compared to poultry and fish, and keeps for longer. However, the carcass is very important for cooling and storing of meat, and in terms of both preventing spoilage and maintaining its freshness for a long time. Spoilage rate of meat after being weighed and during the cooling should be under 2%. On the other hand, dark and bruised meat will reduce its market value.

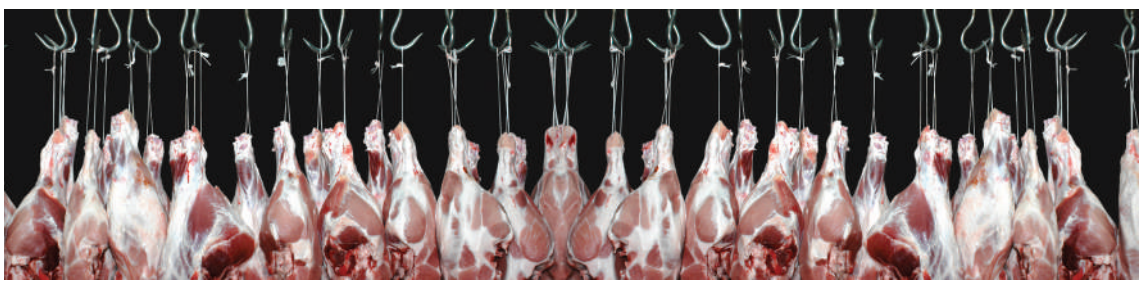
Therefore, it is very important that cooling systems and capacities are built accurately. Another important issue is the duration of storing to maintain the freshness of the meat. After the meat is removed from the carcass and cut into pieces, it can be kept in vacuumed packaging in cold storage without freezing for 60 days maintaining its freshness.

It is possible to extend the storage life of fresh meat to 90 days with a simple additional preventive procedure. The one and only way of doing this is to reduce the PH value of the meat from 7, when it was first slaughtered, to 5,6 and keeping it at 5,6. This method also enhances the taste of meat creating commercial opportunities in countries with big meat demands.

vacuum-packed meat

Carcass meat is the main raw material of the meat industry. While butchers are supporting the retail meat market with these carcasses, all the other processed meat products are also produced with the meat removed from the same carcass. Even if you have the right animal race and the right way of feeding the animal, you should obtain the right carcass from your animal.

Let's respect and protect our meat paying special attention to how much water and feed we use to obtain a kilo of meat.



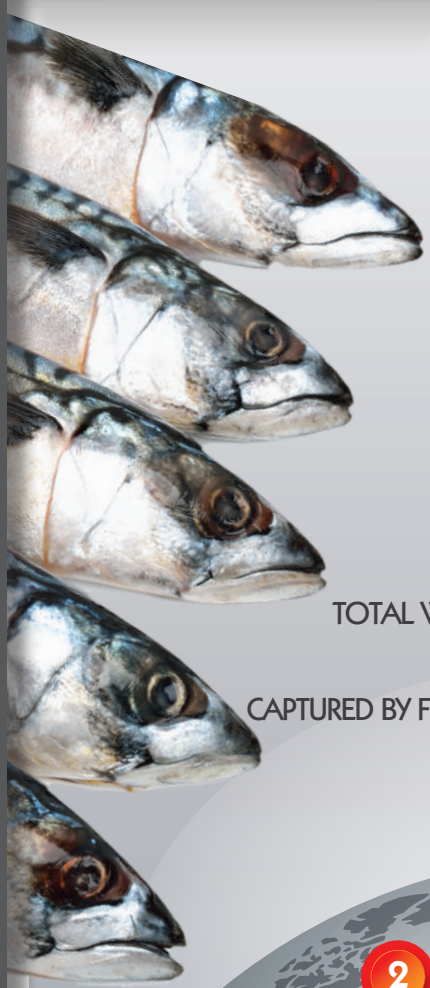
FISH

Non-settler primitive people living along the riverbanks and on the shores of seas and lakes learned how to catch fish by watching how other species hunted.

Primitive people had not known agriculture yet and gained their food by hunting with simple tools and foraging. Fish was tasty food caught with bare hands for primitive people.

Archaeological evidence show that during the Neolithic Age, people made harpoons, fishing rod and fisherman's gaff out of stone, wood, bone and thorn. After they had begun settling down, they discovered easy methods of catching fish such as trapping the fish in confined water by blocking the fish with natural materials, which were processor of modern fish pods.

The first written records on fishery were the ancient Egyptian inscriptions dating back to 2,000 B.C. These inscriptions reveal that Egyptian fishermen had used some forms of nets since 3,000 B.C.



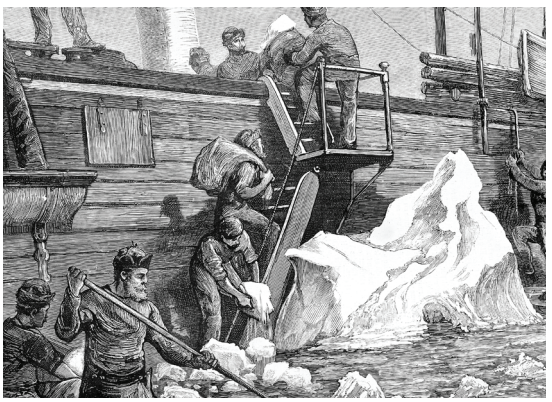
TOTAL WORLD FISH PRODUCTION OF 168 MILLION TONNES CONSISTS OF 95 MILLION TONNES CAPTURED BY FISHING IN WILD FISHERIES AND 74 MILLION TONNES PRODUCED BY FISH FARMS

FISH INDUSTRY LEADERS

1 CHINA	PERU	INDIA
49,5 million tonnes	10 million tonnes	6 million tonnes

It is known that Chinese fishermen used ice gathered the frozen lakes, rivers and ponds to store fish. Also, the Chinese were breeding grey mullets in pools filled with salt water in 3,000 B.C. Ancient Romans bred carp and European chub in pools.

Cooling freshly caught fish to extend their storage periods was first invented when fish was transported from Scotland to England by sea in the 18th century.



British fishing boats

Ice was first used in English fishing boats in 1850, and manufactured ice was tested in fishing boats towards the end of the 19th century. Although some methods were developed after that, none of them were as beneficial as ice used in cooling fish.

Fish is a nutrient-rich, excellent food source for human diet. With its rich content of protein and polyunsaturated fatty acids, it is a very important food as it meets the body's basic nutrient needs, and makes good impact on human physiology and metabolic functions in terms of a healthy lifestyle and preventing from diseases.

Fish contains 18-20% of protein and a rich source of vitamins A, D and B. It is packed with phosphor, iron, selenium, iodine, calcium and a very significant source of omega 3.

Fishing and seafood industry is a very important source of income for hundreds of thousands of people around the world. Global per capita fish consumption reached 20 kg due to the dynamic growth of fish breeding meeting half of the total consumption.

Chinese fish trade

Recent expert reports draw attention to how the estimated increase in the world population in 2050 will affect the seafood supply of the oceans and seas.

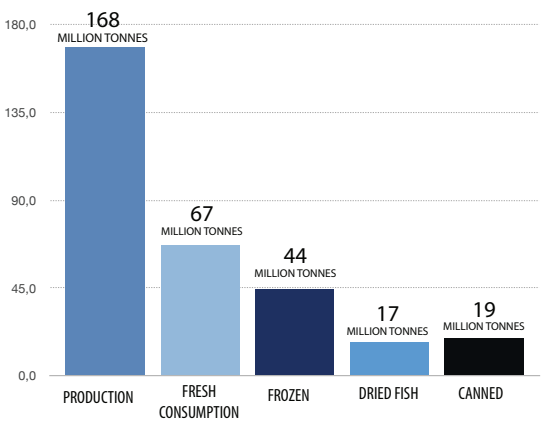
Total global fish production is 168 million tonnes, 95 million tonnes of which is through fishing and 74 million tonnes of which through breeding. China produced 49,5 million tonnes, which made up 60% of the total global production, in 2014. Other large fish producer countries are Peru, India, Vietnam, Bangladesh and USA.

Four species of commercial value are tuna, lobster, prawn and cephalopod. Total production of tuna and similar species is about 7,7 million tonnes. In breeding areas, mostly carp family is bred.

Total global fish production is 168 million tonnes (67 million tonnes fresh, 44 million tonnes frozen, 17 million tonnes dried, salted and smoked, and 19 million tonnes canned).

The European Union by far was the largest import market in 2014 and 2015 followed by the United States and Japan.

WORLD FISH TRADE



Canned

Fishing industry is the primary industry for revenue generation, employment, food safety, food and foreign currency income for many developing countries. Fishing export of developing countries in 2014 was 80 billion U.S. dollars. This amount is more than major agricultural commodities such as rice, tobacco and sugar.

It is projected that the total global fish production will reach 196 million tonnes in 2025. The reason behind this increase is rise in income, urbanisation, improvement in storage capacities and distribution facilities.

In 2025, Asian countries will represent 89% of the total global production, still maintaining it position among the largest producers. It is estimated that one other significant increase will be in Latin America, particularly Brazil along with China.

COLD STORAGE

Delivering fish to the consumer with its quality maintained outside a fishing period is only possible with the right cold storage method. Cooling is performed by lowering the temperature of fish to 0°C. Cooling fish products with ice sheets give very good results. Fresh seafood is kept in cold storage at average 0°C and put up on the stalls on cube ice.

Freezing is performed in order to extend the storage time, and plays an important role in minimising spoilage and financial losses, and controlling public health problems and foodborne pathogens. Fish products are frozen at minus 35-40°C and then taken into the storage at minus 180°C to be stored for a long period.

Glazing method is used for fish storage, as it is prone to spoilage. Washed and pre-cooled products are frozen at minus 40 °C for 5m/sn in draughty units. When the inner temperature of the products is reduced to minus 18 °C, they are taken to glazing room where package is done. Glazing is an ice application on the surface of the product to protect it after the freezing.

Frozen and glazed fish is packaged with PE bags, vacuumed or stretch filmed before barcodes with the information about the fish are attached. Packaged products are piled according to stacking rules in frozen storage rooms with 'first in first out' method.

Rapid population growth, senseless overfishing and adverse environmental effects cause the natural fish sources to decrease rapidly and some fish species to become extinct. Even if some precautions are taken at this point, natural fish stock will never be the same and the depletion of natural fish stocks will be replaced with culture fishing.

Hatchery production was 5% in 1970 and 10% in the 1990s, when there was a rapid increase; but today it reached 40%.

It is projected that investments in seafood will increase in 2025, and the amount of production through breeding will be equal to fishing. According to estimates, breeding industry will overtake fishing industry in 2050.

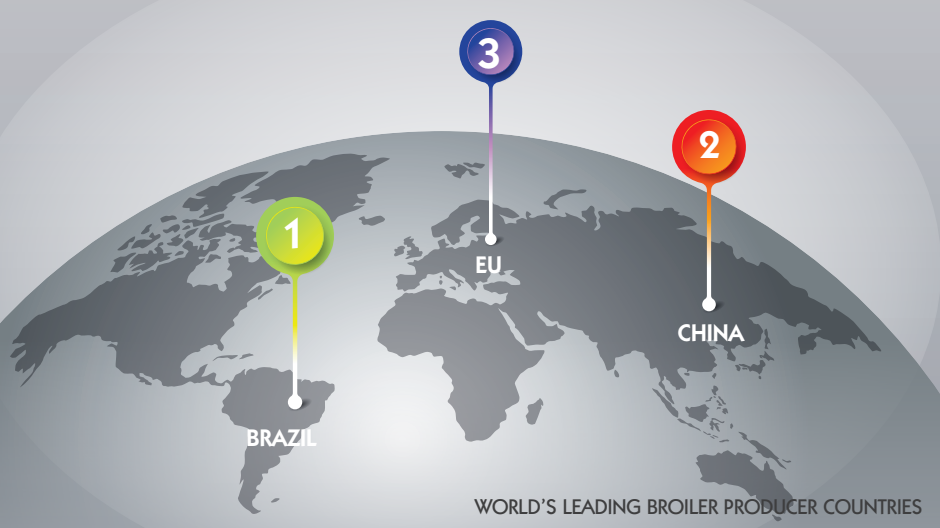
CHICKEN

History of domesticating chickens goes back to 2,000 B.C. According to historical records, it is estimated that the first ancestors of today's chickens lived in Southeast Asia. It is known that four wild chicken species that still exist were the origins of the modern chickens. Domesticated chickens spread initially from Southeast Asia to Europe through the tribes in the Russian steppes.

Poultry industry began to develop rapidly after the Industrial Revolution. Thanks to the earliest modern chicken coops, in which heat, light and humidity could be controlled, developed in the first half of the 1900s, chicken farms with high production capacities rapidly became prevalent all around the world.

The real improvement began with the development of cooling technologies after 1945. Productive breeds were obtained through breeding activities and rapidly replaced with standard purebred chickens in the industry. Large breeding facilities were established providing hybrid breeds called broiler for commercial enterprises.

WORLD'S TOTAL CHICKEN PRODUCTION IS 100 MILLION TONNES



WORLD'S LEADING BROILER PRODUCER COUNTRIES

BRAZIL	CHINA	EU
13 million tonnes	13 million tonnes	11 million tonnes

In the previous years, chicken meat production ranked second following the egg production, and only old hens, which stopped laying eggs, were sold for their meat. However, with the fast development of technology in the mid 20th century, as a specialised industry, chicken meat production overtook the egg industry.

Improvements and inventions on coop building methods, equipment and feeding were increased, and chicken and egg production rapidly developed turning into a giant industry.

Chicken industry has found a stronghold in the markets since the production time in chicken meat industry is very short, intensive production is possible in the unit area, labour is cheaper compared to other agricultural enterprises, and chicken meat is cheaper than red meat.

Although fat and energy content is lower in poultry such as chicken, turkey, duck and goose compared to beef and other types of meat, they are richer in protein. And egg is a very rich source of minerals, vitamins and proteins, tasty and easy to digest.

Chicken meat and products contain all the necessary amino acids in balanced and sufficient amounts. Along with containing low fat and cholesterol and being a rich source of protein, chicken is packed with B2, B6 and B12 vitamins.

The leading countries in broiler production are Brazil and China with over 13 million tonnes and the European Union with 11 million tonnes. While global chicken production was 7.6 million tonnes, today it is more than 100 million tonnes.

Chicken and its products are in a key position in terms of today's biggest problem, malnutrition, because chicken, by nature, is one of the lowest cost products that can be produced fast and easy. Today, chickens are bred for meat and eggs, and both are high yielding production. During the laying period, average number of eggs goes up to 330. It is possible to obtain 1 kilo of live-weight with 1.6 kg of feed.

Increasing and improving chicken production seems to be a great opportunity for the future of our planet. Let's assume you have 1 million chickens with average weight. When you slaughter them all, you will have 1 million kg of carcass meat.

So, how can you make use of this much meat?

At this point, producing alone does not suffice. If you don't have cold storage, all your wealth goes wasted before the sunset!

Chicken also creates a large-scale economy through the further processing industry products such as sausage, sucuk (fermented sausage), jambon and salami. In the recent years, ready-to-eat sliced cooked chicken in packages of 40-120 grams became very popular. Also, semi-cooked chicken products such as schnitzel, nuggets and döner kebab are prepared in 5 minutes and a good alternative for those living in a fast-paced city life.

One other profit item of chicken products is special sauced chicken menus in fast food stores competing with one another and increasing rapidly in the recent years.

Chicken nuggets

The first stop of live mature chickens after the 6 weeks of growth period is slaughterhouses. In Muslim countries, chickens are slaughtered according to Islamic rules, while in many countries it is performed with machines.

Chickens become a cooled (at 0 C° to 4 C°) and packaged product in just 2,5-3 hours after they are slaughtered in chicken processing facilities. Some of these chickens are sent to cold storage after passing through the quality control. Some of them are packed in bags. And the remaining part is sent to the cutting and further processing for product diversification.

Chicken meat is more prone to spoilage compared to red meat. Therefore, storing temperature and microorganism content at the beginning of the storing have a direct influence on the quality meat.

Chicken can be stored as fresh and frozen. Fresh products are distributed to stores as cooled at 0C° to 4C° with the two weeks shelf life without the use of cold chain.

The shelf life of frozen products varies between 6 to 24 months depending on the storing temperature and whether they are carcass or chunks of meat. Freezing is carried out in quick freezing rooms at minus 35-40oC, and frozen products should be kept in rooms with a fixed temperature of minus 18oC.

Breeding chicken requires a full-equipped organisation. Feed and chick supply is very important. Today, the capacities of chicken farms are improving fast.

Global chicken production profits have already outrun the profits from cattle and sheep production with over 100 million tonnes. It is expected to overtake the pig industry, which today ranks first, with over 120 million tonnes in 2020. Statistics show that the highest meat production is in chicken industry and it will continue increasing.

Since chicken has a high-yielding potential and is the cheapest affordable protein source, it looks promising in solving our nutritional problems in the future of our planet.

Chicken Hotdogs

BAKERY

The seeds of one of today's staple food were spread during the Neolithic Age, when our ancestors stopped living as nomads and began settling down.

Population of prehistoric people began increasing due to more favourable climatic conditions after the lengthy Ice Age, and people needed more food than they could gather in nature.

Hunter-gatherer groups discovered wheat, which they had to crumble, as it could neither be chewed nor digested by humans without being softened. They began soaking wheat crumbles and obtained dough turning it into bread which was nothing like today's bread, and cooked it on heated stones. This substantial food must have motivated our ancestors to live in a settled life.

The hunter-gatherer lifestyle, which humans had continued for thousands of years since the earliest days of humanity, changed into settler-producer lifestyle 10,000 years ago, as planting and harvesting required staying in one place for a long time.

TOTAL GLOBAL WHEAT PRODUCTION IS 732 MILLION TONNES

LEADERS OF WHEAT PRODUCTION

1	2	3
CHINA	INDIA	RUSSIA
130 million tonnes	89 million tonnes	61 million tonnes

Göbekli Tepe

Egyptian fresco

The first settlement of the Neolithic Age was the triangle region among southeast of Anatolia, Northern Syria and west of Iran. The most significant archaeological findings supporting this argument is that a wheat cultivar, ancestor of today's wheat was found in Göbekli Tepe, a prehistoric settlement in the southeast of Turkey, dating back to 10,000 years ago.

Wall paintings of the ancient Egyptians, which depict women grinding grain on stones to make flour, are the evidence of how bread was important for the Egyptian culture. Bread in those periods was fairly tough, but it was very easy to move these flat loaves to military camps or hunting regions.

It is widely believed that an Egyptian baker left the bread dough in the direct sunlight, and the dough was fermented until the baker found it. When the baker put the dough in the oven, he noticed that the bread began rising easily. This yeast bread, demanded by the rich and noblemen, became so valuable that it began to be used as money in Ancient Egypt.

Ancient Greeks learned bakery from the Egyptians and began baking similar bread. Then the Greeks taught Romans in 600 B.C.

There were 254 bakeries in Rome in 312 B.C., and laws determined basis weight and price of bread.

Making flour in a traditional way for the Neolithic era

Traditional bread baking on the Nile.

In time, bakers' guilds began to be established varied by the type of bread. . Bakers' guilds strengthened the position of honest bakers while growing the baker community's social status. Those, who harmed bakers, were asking for trouble, and a baker, who violated the guild's rules, were whipped in public, dragged on the streets or ostracized from profession.

Ancient Greeks invented water mills in the year 1 B.C., and Arabs built a windmill in 700 A.D. In 1859, French scientist Louis Pasteur revealed that fermentation was caused by yeast. Design of furnaces and methods for grinding flour were improved. After Emile Christian Hansen had managed to obtain pure yeast culture, fresh yeast began to be produced after the 1870s.

In Europe, bread made with white flour was a luxury for many people as it was difficult to produce flour in Europe.

The first successful windmill was built in 1880 in Switzerland. This windmill sifted out the bran that made the flour dark coloured, and thus, baking bread with fine flour became widespread.

Although the Spanish introduced the Americas with wheat by taking it to Mexico in the 1500s, it took a few centuries to find favourable fields and use wheat widely.

Turkey ranks first in per capita consumption of bread in Europe with 120 kg. It is followed by Bulgaria with 95 kg, Germany with 90 kg and Russia with 80 kg. The U.S., France and Italy follow these countries, respectively. Per capita consumption of bread in the U.S. is 85 kg.

Global wheat production is about 730 million tonnes in the 2015/16. China is the leader in wheat production with 130 million tonnes, followed by India with 90 tonnes and Russia with 60 million tonnes.

Bread makes up the 80% of bakery market in Europe. While fresh products make up the 70% of it.

Bread is distributed as packaged-long shelf life, packaged-semi baked, packaged fresh and frozen.

The commercial history of frozen bread, bun, cake, pizza and ravioli goes back only 15 years ago. Canadian, Swiss, Mexican and Italian companies first noticed this commercial opportunity, and they have the biggest market shares in this industry.

The United States, the European Union and Russia have the highest demand for these products. Pizza is the most consumed food among frozen bakery products, and hamburger bun, puff dough, croissant, ravioli and pastry types follow pizza, respectively.

Retail bakeries keep many product types by deep-freezing in order to meet the demand fluctuations. With the increase in the number of retail stores, frozen food products are delivered in cold chain, and baked to serve hot to the consumer.

There are two methods for storing bakery products. When freshly cooked products are demanded all day long, cooling process is performed only to reduce to a temperature enough to delay fermentation in dough. Temperatures of 0 Co to 4,5 Co delays fermentation and dough is stored between 3 days and 3 weeks. After frozen products are deep-frozen at -35 Co -40 Co, they are stored at 18 Co. Varied by the ingredients of the products, they can be stored for a year.

Baked product industry is in continuous improvement in parallel with growing demands and in the increasing commercial success thanks to frozen products. Cold storage always makes our lives easy by offering commercial opportunities.

Although sales of frozen pastry products showed a slow growth in the past, bakery product industry is now among the fastest growing industries.

Competition became inevitable after the number of boutique bakeries increased and new retail stores were opened in shopping malls. This competition brings display, taste, variety and quality into the forefront.

Let us finish our words with a quote from the American biologist Dr. Norman Barloug, born of Norwegian descent:

"If you desire peace, cultivate justice, but at the same time cultivate the fields to produce more bread, otherwise there will be no peace."

MILK

Starting from birth, milk and milk products are the staple food vital for human diet.

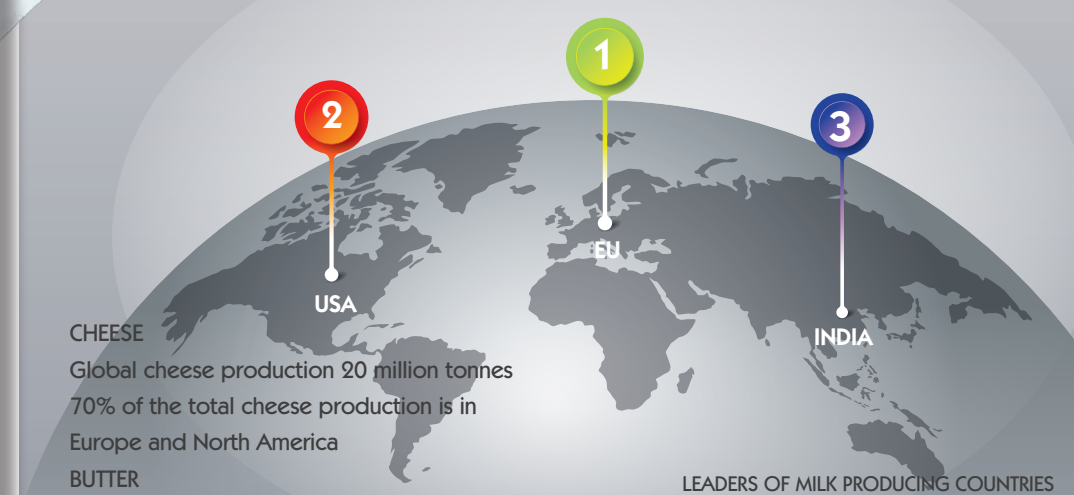
Talking about the history of milk does not require giving any dates. 20 seconds after a baby born, it finds nipples only following the smell without even seeing around in its mother's arms. Mother does not even know what is happening.

Humans must have attracted by slightly yellowish white coloured liquid that is produced in the mammary glands for female mammals to feed their babies, and contains all the necessary nutrients for the baby.

How could human intelligence knowing how to use every opportunity keep away form such food?

It is estimated that milk consumption dates back to 9,000 B.C. in Iran, Afghanistan and Anatolia after the domestication of animals.

WORLD MILK PRODUCTION IS ABOUT 800 MILLION OF TONNES



CHEESE

Global cheese production 20 million tonnes

70% of the total cheese production is in Europe and North America

BUTTER

Global Butter Production 10 million tonnes

40% of the total butter production is in India

YOGHURT

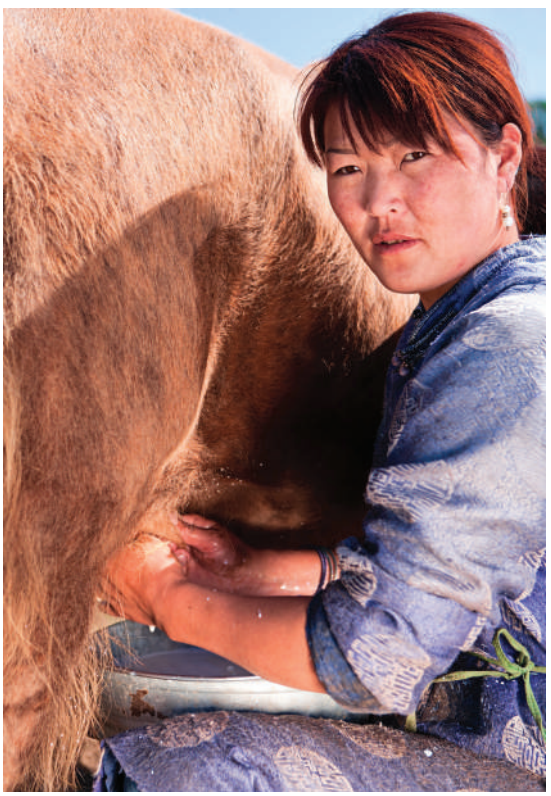
Global Yoghurt Production 60 million tonnes

60% of the total yoghurt production is in Saudi Arabia

LEADERS OF MILK PRODUCING COUNTRIES

1 EU	2 USA	3 INDIA
160 million tonnes	92 million tonnes	65 million tonnes

Ancient Thracians produced yoghurt like food that had a sour taste. It is estimated that Turks, Mongols and other nomadic tribes introduced milk-processing techniques to modern Russians and Middle East countries.



According to Homer, cheese was produced during the ancient Greek and Roman periods. Hard cheese types were good source of protein for the Roman soldiers and travellers.

The Spanish introduced the Americas with milk in 1525 when they took dairy cattle to the Gulf of Mexico from where they spread to the entire continent with the name of Vera Cruz, the city where the cattle were brought.

ABILITY TO STORE MILK

We can write pages about the history of milk; however, the real story of milk is based on its preservability. In the past, milk could not be stored due to the amount of water in milk and its being an extremely favourable medium for microorganisms because of its biochemical components. And thus, it caused diseases to spread.

In 1862, French biologist Louis Pasteur proved that microorganisms are responsible for fermentation and contagious diseases. Thus, he disproved the theory of spontaneous generation.

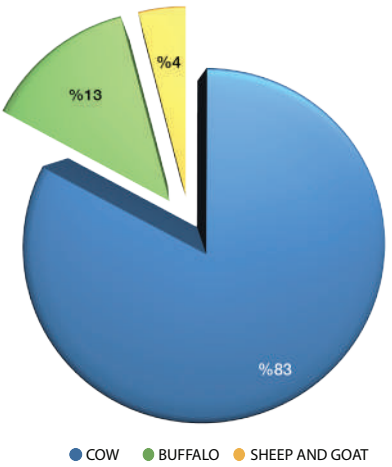
Therefore, Pasteur developed a method of conservation, pasteurisation, which allows long-term storing particularly for milk, and fermentable liquids such as wine, beer and fruit juice and is named after his surname. This method was performed by heating milk at 63°C for 30 minutes and then quickly cooling it before it is poured in covered and sterilised containers.

The first milk bottle was used in New York in 1884. In 1895, Pasteur introduced commercial pasteurisation machines, which revolutionised milk industry, to the world. With the invention of this method, storing milk, distributing it to long distances and producing milk products now became possible.

Today, the global milk production is 800 million tonnes and the largest milk producer is the European Union with 160 million tonnes, followed by the United States with 92 million tonnes and India with 65 million tonnes.

The system in the milk industry after the second half of the 20th century was based on the fact that countries met their own demands first and then sold the surplus of production to the neighbouring countries.

83% of global milk production is obtained from cows, 13% from water buffalo and %4 from sheep and goats.



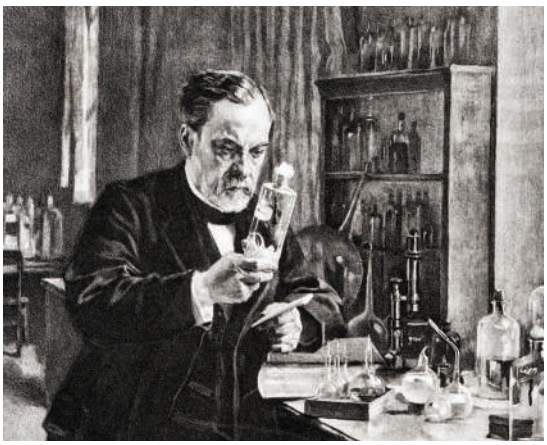
Total global cheese production is 20 million tonnes. Although various types of cheese are produced traditionally on local basis, 70% of the demanded and traded cheese on the international market is produced in Europe and North America. Global butter production is 20 million tonnes and %40 of this amount is produced in India. Global yoghurt production is only 60 thousands tonnes, 60% of which is produced in Saudi Arabia and 14% in Turkey.

At a rough estimate, approximately 160 million tonnes of milk is needed for 10 million tonnes of cheese, and 140 million tonnes of milk for butter. So, about %37.2 of the global production is used for the production of these two products vital for human health.


Cheese


Butter

As the saying goes, one man comes up and changes the world.


Louise Pasteur (1822-1895)

Chemistry professor and one of the greatest men of his time, Louis Pasteur did not only change the history of milk that humans had been drinking for 11 thousands years, but also paved the way for long-term storage of fermentable liquids such as milk, wine, beer and fruit juice through pasteurisation.

We learn new information about this liquid every single day. Along with being a miracle on its own, milk products such as yoghurt, butter, cheese, kephir, crème, ice cream, smetana, ayran and milk powder are also vital for human life.

This miraculous liquid contains three basic elements of good nutrition, fat, carbohydrates and proteins, and also is a rich source of very beneficial minerals of calcium, phosphor and magnesium.


Yoghurt

A glass of milk (200 ml) contains about 130 calories.

When we drink a glass of milk, we take 6,8 g of protein, 9,4 g of lactose, 7 g of fat, 1,5 g of minerals most of which are potassium and calcium, and 0,7 g of vitamins A, B2, B12, D, E and K.

Milk is a vital nutrient for all mammals. Transporting milk from its production facility to the industry requires an arduous and planned organisation.

The entire journey of milk from the milking onwards for it to remain healthy is enabled with the help of consistent cooling. Dairy products such as daily milk, cheese, yoghurt and butter are all wonderful, delicious and healthy food.

Per capita global milk consumption is 110 kg, however, there are some regions around the world where accessing milk is still difficult.

Milk has processing standards strictly determined globally as of the moment it dropped from the breast into bucket. Hygiene and cold storage are very important at every stage of it. Milk is without doubt one of the most important commercial good in the world economy. And also, the demand for dairy products will gradually increase in our world with a fast growing population.

Today, with the commercial boundaries being removed and the industry being shaped using the new technologies, dairy products can now travel all around the world.

APPLE

Mentioned in sacred books and empowered its fame through mythological stories, apple is the second most widely consumed fruit globally after banana with a production over 70 million tonnes.

Apple cultivation, originated in Tian Shan Mountains, stretched near the border between Kazakhstan and China, has increased by 70% in the past 20 years. 90% of this increase belongs to China where apple production is encouraged by the government. China has consolidated its power in this industry with a production capacity of 38 million tonnes,

Apple has been cultivated in Europe and Central Asia for 2,000 years and was introduced to Americas in the early twentieth century. Apple cultivation has also been encouraged in the United States making it the second biggest apple producing country in the world with its 5 millions tonnes of production.

Apple producers in Turkey has raised 300 thousands tonnes of apple production started with a venturesome production in 1965 to over 5 million tonnes today. Except for the European Union, Turkey is the third biggest apple producer in the world.

WORLD APPLE PRODUCTION IS ABOUT 71 MILLION OF TONNES

LEADERS OF APPLE PRODUCING COUNTRIES

1 CHINA	2 USA	3 TURKIYE	4 EU
38 million tonnes	5 million tonnes	3 million tonnes	13 million tonnes

Apple Pectin

Apple is a widely favoured and affordable fruit that can be cultivated anywhere in the world apart from the arctic regions. It can be eaten with the skin on, has small seeds and plenty of health benefits.

Apple is loaded with Vitamin A, B vitamins, vitamin C and vitamin E along with the minerals of calcium, potassium, magnesium, phosphor and sodium and various organic acids.

After harvest, while small quantities of apples are sent to fresh market for imminent consumption, a large proportion of them are sent to cold storage to be sold later in the year. What remains forms a large sub-industry.

Countless by-products such as apple juice, cider vinegar, apple molasses, dried apple roll-up, wine and apple pectin are produced as part of the apple industry.

Apple molasses and fruit leather

Almost 90% of apples are produced in the Northern Hemisphere. Apples are harvested in October and November, and become unpalatable at ambient temperature in two weeks; therefore, nearly 40% of apples are kept in cold storage to be consumed all year round.

Cold storage capacities of apple producing countries vary considerably along with their storing methods. In countries with high storing quality and capacity, apple prices increase during the postharvest and later periods.

As for countries with poor storing capacity, apples are piled in markets after harvest due to insufficient number of cold storage, resulting in lower prices and profit loss for producers.

15 million tonnes of 70 million tonnes of apples produced annually around the world are wasted due to poor storing methods.

What is the best way of storing apples?

Although the best way of storing apples is known as cooling, apple producers don't store apples with this method anymore. The atmosphere in apple storages is controlled, and the level of oxygen is reduced to minimum through cutting-edge technology.

Therefore, increasing carbon dioxide level slightly regulates natural aspiration of the fruit. In these types of storage rooms, ethylene absorbers remove ethylene gas, which is released by apples and causes to spoil them quickly is repressed with the help of 1 MCP systems. Humidifiers control the level of humidity in these rooms.

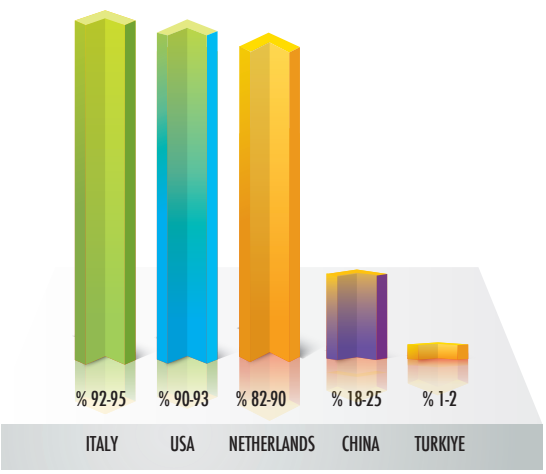
Thanks to this excellent coordination, some apple varieties can be stored at 0°C for over a year without being wasted. Apples stored in controlled atmosphere rooms have much longer shelf life.

So, how much of apple produce is kept with this state-of-the-art technology method today?

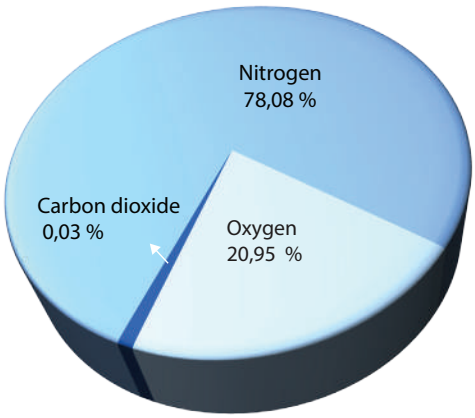
Unfortunately, just 4 million tonnes of 70 million tonnes of total global apple production are kept in controlled atmosphere rooms.

Producers make better profits through controlled atmosphere storage rooms.

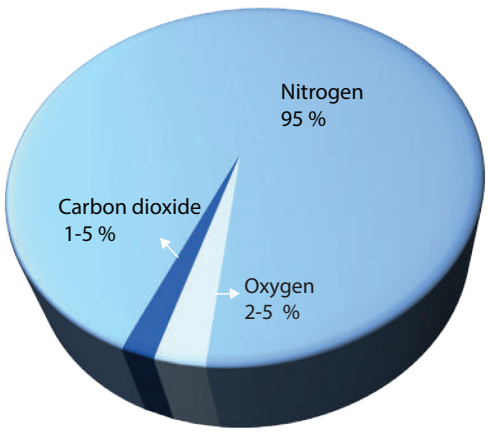
Percentage of controlled atmosphere systems in apple storage in the world



This, in fact, results in better commercial opportunities.



Standard Atmosphere Values



Controlled Atmosphere Values

GRAPE

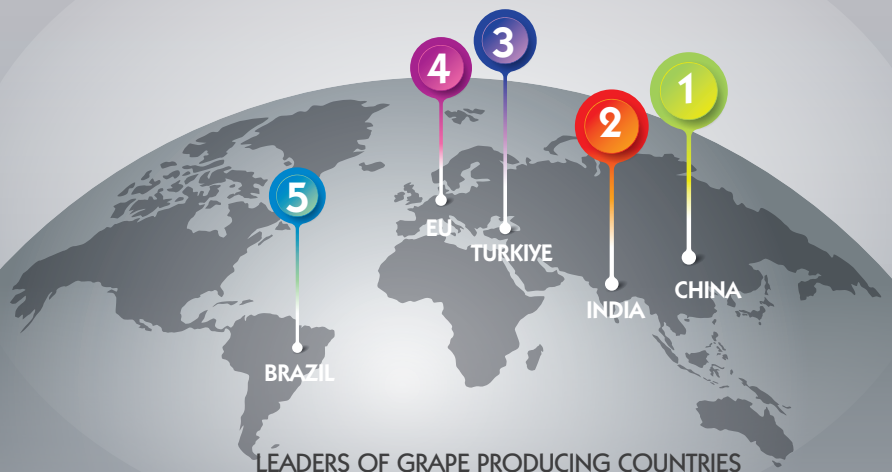
Origins of grape vines go back to millions of years ago, and Caucasus, south of the Caspian Sea and North East Anatolia are known as the native lands of grapes. Modern Georgia, Armenia, Azerbaijan, Iran, Anatolia and part of Russia are the regions where grapes spread to the world. The availability of many indigenous grape varieties in these regions seems to prove this estimation.

Vine cultivation goes back as far as to tribal civilizations. Although it is known that development of vine cultivation dates back to 6000 BC, it is estimated that wine production began long before.

Over 70 million tonnes of grapes are cultivated all around the world. Nearly 30% of this amount is consumed as table grapes, and the remaining part is sent to the industry creating a large-scale economy. Along with their fresh consumption, grapes are used in the production of wine, molasses, fruit leather, jam, juice, vinegar, grapes seed oil and rakı.

Fresh and brine vine leaves are widely used to make "sarma" a special rice stuffed rollups. Along with these, grapes are used in making confectionary, biscuits, chocolate and fruity yoghurt.

WORLD GRAPE PRODUCTION IS ABOUT 70 MILLION OF TONNES



LEADERS OF GRAPE PRODUCING COUNTRIES

CHINA	INDIA	TURKIYE	EU	BRAZIL
9 million tonnes	2,5 million tonnes	2 million tonnes	1,7 million tonnes	1,4 million tonnes

According to the data on the world table grape production, China is the leading country with a production of 9 million 600 thousands tonnes. China is followed by India with 2 million 500 thousands tonnes and Turkey with 2 million tonnes of production. The European Union, Brazil, Chile, the United States, Peru, Ukraine and South Africa are the other largest grape producers.

Being one of a few leading producers in the world, Turkey is also the leader and price setter of the raisin industry. The estimated number of varieties of indigenous grapes in Anatolia is more than 1,200.

Packed with plenty of vitamins B, C, E, grapes are also rich source of potassium, calcium, sodium, phosphor, iron, magnesium and sulphur. It is stated that grapes and grape juice reduces the risk of colon cancer by 50%. This healing fruit is a strong blood purifier also reducing the levels of cholesterol thanks to the inositol contained in it.

GRAPE STORAGE

Today, many grape varieties can be stored in modern storage for longer periods. This characteristics of grapes help them find domestic and foreign markets all around the world creating a large-scale economy.

Succeeding in the storage of grapes depends primarily on their health and quality. Unlike apples and pears, grapes cannot continue ripening after the harvest. Therefore, they should be harvested when they are ripe and quickly be transported to cold storage.

The point where the biggest intervention is required in storing grapes is a facultative saprophyte such as botrytis cinerea.

Although the fact that grapes don't continue respiration, and stop ripening after the harvest provides advantage in terms of storage, preventative measures should still be implemented against botrytis cinerea.

There are more than ten methods in preserving grapes, but the most commonly used method is the use of sulphur dioxide gas. Sodium metabisulfite gas is used in this method, by being incorporated into nylon sacks and papers to modify atmosphere conditions.

Botrytis Cinerea

Immediately after the harvest, grapes are filled in Modified Atmosphere Packaging and then papers absorbed in sodium metabisulfite are placed under and on top of grapes before they are stored in cold storage.

Sodium metabisulfite burns by absorbing the water vapour released during the respiration of grapes. As a result of this reaction, sulphur dioxide is formed in a certain level of density. This is the most commonly used method to combat botrytis cinerea during the storage of grapes. During all these applications, characteristics of nylon sacks, papers' expiry date, gases within the sacks and humidity levels in the room should be paid special attention.

The fact that the temperature of grapes for long-term storage is lowered in pre-cooling rooms and then stacked in the main cooling room is very important and beneficial in terms of keeping their quality. Since the sugar levels of grape varieties differ when they are harvested, their freezing point also varies; therefore the temperature should be controlled as the sugar levels increase. Grapes should be kept in polyethylene bags manufactured specifically for grapes at 1°C in order to keep the quality of grapes whose temperature is rapidly lowered. After this preparation, grapes can be kept for three months with no spoilage. When these treatments are carried out with care and with the help of the experiences gained over time, grapes will be able to be kept for up to 5 or 6 months.

Modified Atmosphere Packaging (MAP)

Picture 1

Picture 2

Picture 3

Picture 4

CITRUS

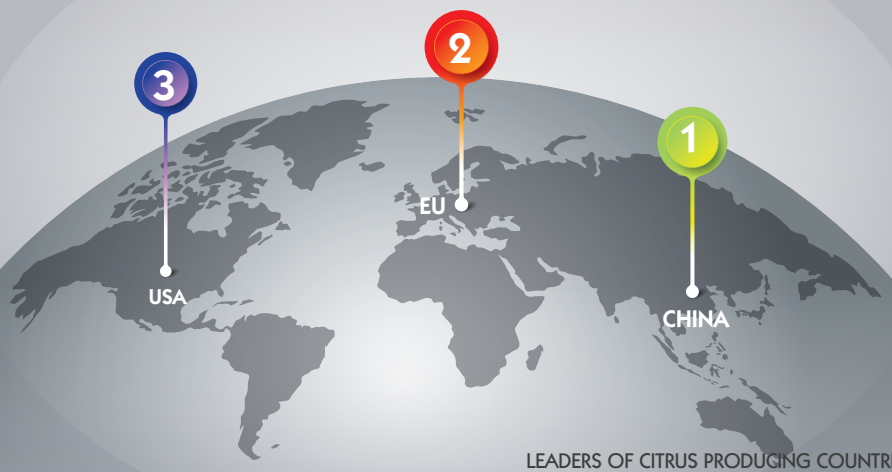
Citrus fruits are grown between 20° and 40° N and S latitudes and native to South East Asia. It is estimated that history of citrus fruits goes back to 20 millions years ago in the tropical and sub-tropical regions of Asia.

Growing from the tip of their white flowers, these yellow and orange coloured and juice dripping fruits spread from Asia to Europe and then to Africa. Although orange was first introduced in Florida by the Spanish as a Spanish fruit, some wild varieties of orange were encountered in some regions of America where red Indians lived.

With a global production of nearly 46 million tonnes, orange has the highest commercial value among the other citrus fruits. Tangerine with 29 tonnes, lemon with 7 million tonnes and grapefruit with 6 million tonnes of production follow Orange.

46 MILLION TONNES OF ORANGE
29 MILLION TONNES OF MANDARIN
7 MILLION TONNES OF LEMON
6 MILLION TONNES OF GRAPEFRUIT

WORLD CITRUS PRODUCTION IS ABOUT 88 MILLION OF TONNES



LEADERS OF CITRUS PRODUCING COUNTRIES

1 CHINA	2 EU	3 USA
32 million tonnes	11 million tonnes	8 million tonnes

Out of total global citrus production of 88 million tonnes, China is the largest producer with 32 million tonnes followed by the European Union with 11 million and the United States with 8 million tonnes of production. Other large citrus producing countries are Mexico, South Africa, Turkey, Egypt, Argentina and Morocco.

Although the biggest buyers of citrus are developed countries such as the European Union, the United States, Russia and Canada, citrus fruits are sought after fruits in all countries around the world. European countries are good producers as well as being good consumers. There is a great demand for citrus fruits among Russians, who are conscious consumers in terms of healthy diets.

Their peels, leaves and flowers are used for making tea, fragrance and flavouring. Essential oils of these orange and yellow fruits are widely used for making perfume, deodorant and crème.

Although citrus fruits are commonly used for making jam, marmalade, tea and bakery products, their primary market is fruit juice industry.

Citrus is very popular for its fleshy fruits with juice sacs, distinctive flavour and aroma. Along with being packed with vitamin C, citrus fruits help boost the immune system with alkaloids, flavonoids and carotenoids contained in them. They are also rich source of fibre, organic acids, potassium, calcium and magnesium. Scientific research shows that all this rich content has many health benefits such as preventing cancer, purifying the blood, improving liver function and beautifying the skin.

Scientists point out that human body does not produce vitamin C, and the daily vitamin C need varies between 50 and 70 mg. According to this, one medium orange a day will provide the daily requirement of vitamin C.

About a third of citrus fruit production goes for processing and more than 80% of this is for orange juice production. According to the Food and Agriculture Organisation data, global orange juice production is 1.6 million litres annually, and the largest orange producer is Brazil with a production of 900 thousand litres. The largest importers of orange juice are the European Union, the United States, Canada, Russia, China and South Africa, respectively.

Orange juice is commonly marketed as frozen concentrated juice; therefore, the cold storage and transportation costs are fairly low.

Harvested citrus fruit should be carried to cold storage quickly after harvest and taken to pre-cooling process. Each of commercial citrus products has different storing values.

A relative humidity of 85 - 90% is required for citrus fruits for storage. While tangerine is stored at 3°C to 4°C for 3-4 months, orange is stored at 4°C to 6°C for 5-6 months, grapefruit at 8°C to 10°C for 5-7 months and lemon at 10°C to 12°C for 7-9 months in normal atmosphere storage.

Although Atmosphere Controlled systems are not as effective in citrus fruits as in fruits like apple and pear, they provide more than a month of extra storing duration.

There is an increasing demand for a healthy diet in our planet with a fast-growing population. Therefore, we should take advantage of commercial opportunities in the best possible way. When citrus fruits are stored in cold storage in the right way, they turn into good profits doubling their production cost.

MANGO

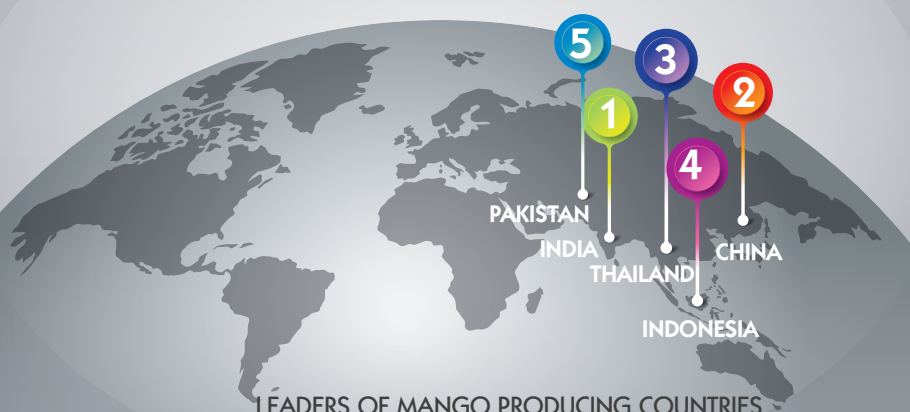
Dating back to 4000 B.C., mangoes are native to the south regions of India and China and was soon taken to Southeast Asian countries such as the Philippines, Indonesia, Java, Thailand, Burma, Malaysia and Sri Lanka.

Mango has a special significance for the culture of Indian religions. Buddhist priests preserved mango that is glorified by Hindus. According to one belief, Buddha's revelations came to him under a mango tree, and this fruit was presented to the world as blessing.

Named by the Portuguese, who went to India in the 15th century, Mango was then introduced to Australia, the Philippines and West Africa.

It was taken to Florida in 1833 and adapted well to this region before being introduced to Brazil, Ecuador, West Indian Indies, Guatemala, Haiti and Mexico. Although it is native to China, mango became popular after 1958 during Mao's rule and became the symbol of agricultural labourers.

WORLD MANGO PRODUCTION IS ABOUT 45 MILLION OF TONNES



LEADERS OF MANGO PRODUCING COUNTRIES

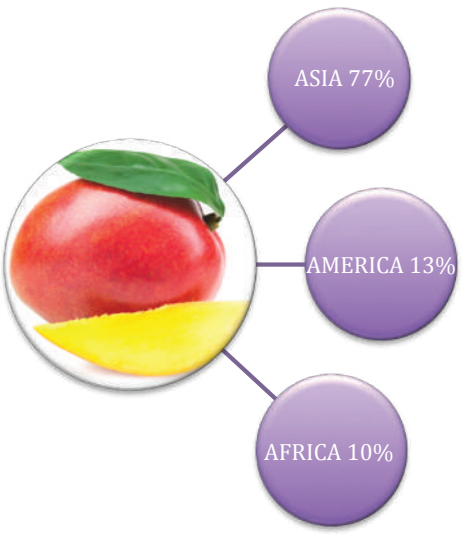
1 INDIA	2 CHINA	3 THAILAND	4 INDONESIA	5 PAKISTAN
15 million tonnes	4,3 million tonnes	2,5 million tonnes	2 million tonnes	1 million tonnes

Flavouring Southeast Asian cuisine, mango accompanies meals, salads, soups and grilled meat. Sour and unripe mangos are used for making mango chutney, which is a spicy condiment in Indian cuisine. Mangoes are processed as juice, dried fruit, powder and puree creating a sub-industry that contributes to national economies of the producer countries. Canned mango puree is particularly in demand among developed countries. Mango adds zest and flavour to milk puddings, pies, cookies, along being used as jams and marmalades.

Unripe mango is used for making juice and pickles, while ripe mangoes are use to produce juice, nectar, ice cream, jelly, cocktail, yoghurt and sauce. Also, it is widely used as dried mango slices and powder. Along with being a rich source of nutrients, mango is a delicious condiment accompanying especially to meat dishes.

Being a symbol of creation and affection, mango is an exotic fruit difficult for the West to reach, while Southeast Asians are blessed with abundant mangoes all year round.

With almost 45 million tonnes of production, mango is the 5th most cultivated fruit in the world. India is the largest mango producer with a production of 15 million tonnes, followed by China with 4 million tonnes, Thailand with 2.6 million tonnes of production.



Nearly 77% of the total mango production is cultivated in its native land, Asia. Asia is followed by America with 13% and Africa with 11% of production.

Mango kernel contains about 8-10% of good quality oil and is a wanted raw material to produce soap, starch and sugar. Giant mango trees have also an industry to produce wooden boats, flooring, furniture and other decorative installations.

Mango seed

Mango tree

Mango contains potassium, magnesium, calcium, phosphor, pro-vitamin A, and vitamins C and B. Thanks to dietary fibres contained in mango, this sweet fruit reduces the levels of bad cholesterol in blood known as LDL. Researches have shown that many compounds found in mango have good efficacy in cancer prevention against colon, breast and prostate cancer types and, leukaemia. Moreover, mango boosts the immune system and protects against infections thanks to its content of vitamin C and carotenoids.

Mangoes are generally harvested when they reach their maximum size before ripening starts. After harvest, mangoes are treated with heat in order to prevent infestations of fruit fly and disinfect some fungus types. This treatment is carried out by heating mangoes in a special liquid at 46°C – 53°C. Since the heat induces ripening, mangoes should rapidly be cooled.

Hence, pre-cooling plays an important role in long-term storage for heat-treated mangoes. Compared to other fruit types, mangoes can be stored for a shorter period. Varied by cultivar, mangoes can only be stored for 3-4 weeks when stored in a temperature controlled storage at 8°C - 14 °C.

It has been found that the length and quality of storage can be improved by the use of the combination of Modified Atmosphere Packaging and 1-MCP applications.

However, storage duration is longer in Controlled Atmosphere cold storage working with the method of ULO (Ultra Low Oxygen). These methods do not require modified atmosphere packaging and increases the storage duration up to 6-7 weeks.

Cold chain should definitely be functioning properly from harvest to the market, as mangoes are very fragile fruits. Among orchard fruits, only mangoes are transported by plane. The main reason for this is that they can be sold up to 10 US dollars on the retail markets of the developed countries.Being one of the staple foods and vitamin source of tropical regions, mangoes are only recently becoming popular in developed markets such as Europe, Russia and the United States.

Calibration

Ripening

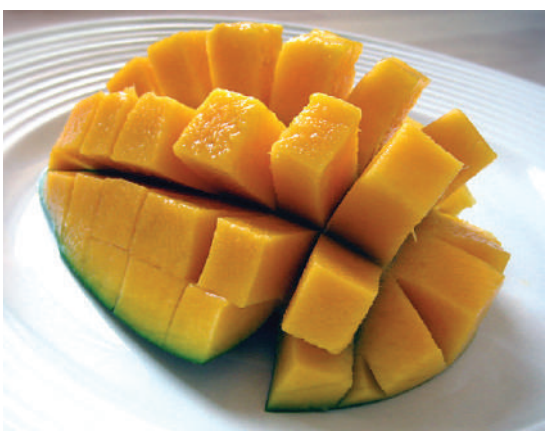
Infected and overripe fruits should not be put in the room. Also, fruits should be taken to ripening rooms as separated by their size. Since ripening periods of the fruit will vary when they are different sizes, required efficiency may not be achieved.

Watering

Vapor-heat treatment (VHT)

It is not difficult to foresee that mangoes will have a strong hold on these markets with its amazing aroma, cancer preventive compounds and new verities developed for longer storage.

Drying



PEAR

Pear is native to the Far East and Central Asia. Grown in the mild temperature zones of both hemispheres, pear is one of the most popular fruits in the world.

Although pear grows in any region where apples can be cultivated, it could not spread out as much as apples did.

It became the symbol of justice, longevity, purity, wisdom and philanthropic government in China where it was first cultivated. While this fruit symbolises grace, nobility and purity, its tree is the expression of comfort and kindness.

Spread from Anatolia to Europe, pear was first favoured by the ancient Greeks and then introduced to Italy and France before it spread all over Europe. Pear became popular in the continental Europe and turned into a symbolic culture. It was introduced to the Americas by the British and French colonists in the early 1800s and therefore its flavour became popular all over the world.

WORLD PEAR PRODUCTION IS ABOUT 25 MILLION OF TONNES

LEADERS OF PEAR PRODUCING COUNTRIES

1 CHINA	2 EU	3 USA	4 ARGENTINA	5 TURKIYE
19 million tonnes	2,5 million tonnes	665 thousand tonnes	650 thousand tonnes	415 thousand tonnes

Asian pear

Total global production of pear is 25 million tonnes annually. Considering the past ten years of pear production, we face a decrease in the production in the Europe and Oceania continents while there is a significant increase in Asia.

With a production of almost 20 million tonnes, China has nearly 80% of the global pear production. The European Union is the second largest producer with a production of 2,5 million tonnes and the United States ranks third with its 665 thousands tonnes of production.

The fact that a product can find a place in the markets today can only be possible through high quality of that product.

The main purpose of storing fruits is to prevent water loss, withering, physiological and pathological deterioration and over maturing.

Temperature is the most important factor in storing pears for longer periods. Determining and using the right temperature is very important in terms of storage life of pears.

Pear jam and marmalade is a sought-after food in the markets. In the recent years, pear slices presented in vacuumed packaging particularly in the EU and the U.S. created a new industry. Pear is often used in sweetening many foods thanks to its taste and aroma. Additionally, it is used for producing puree, molasses, fruit leather, dried fruit, vermouth and wine. Pear was known as the symbol of immorality during the ancient times as Aphrodite blessed it because of its benefits for the beauty and youth of the skin.

Pear contains minerals such as potassium, manganese and sodium, and is a rich source of vitamins A, B1, B2, B3, B6 and C. It is an ideal food for those who want to loose weight, as it is a low calorie fruit packed with plenty of fibres and antioxidant properties.

It is now a well-known fact that no fruits or vegetables can be consumed straight after the production stage and dispatched to the consumer in good conditions without the use of cold chain. The main purpose of the books and documentaries made by the

Cantek Foundation is to emphasise the importance of storage after the harvest and the fact that producing alone does not suffice.

MODERN COLD STORES

Modern cold storage plays an important role in making a fundamental impact on national economies, and is the only method to keep pears in the best possible conditions.

This fruit rapidly releases ethylene after the harvest, and therefore unstoppable aging process begins. Stopping or rather delaying the aging of pear can only be possible through cooling.

Having physiological similarities with apple, pear is easier to keep in cold storage compared to other fruit types as long as the right conditions are provided.

The best method for storing pears is controlled atmosphere cold storage where the level of oxygen is kept at minimum, and carbon dioxide, humidity and ethylene levels are controlled.

Depending on the variety, pear is stored at – 0.5 and 2.5 °C. The temperature varies by the cultivar, region and climate of the harvest.

However, experience is the most important criteria in storing pears just like all other food types. Controlled atmosphere storage gives the best results in pears.

1 MCP systems used along with controlled atmosphere cold storage is very efficient in terms of shelf life. This advanced technology storage provides investors big profits making investments on them attractive thanks to its long storage and shelf life.

Pear is a rarely found fruit type, but when found, it is sold with high prices providing it high market values.

Thus, it should be stored in the best conditions with no spoilage. Although there is a rapid increase in the number of atmosphere controlled storage in the recent years, only 1 out of 8 pears is stored in this type of cold storage.

BANANA

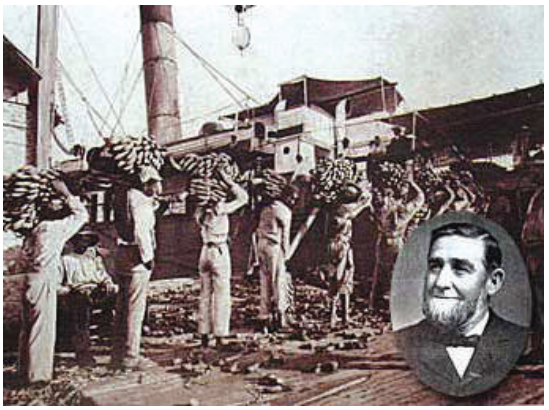
Banana is native to the tropical forests of South East Asia located between China and India. In India, which is the largest banana producer in the world, the meaning of banana outruns its taste. According to Hindus, the forbidden fruit given to Eve by Adam is not apple, but banana. Since the Chinese had kept their distance to banana for a long time, it was not consumed there until the 20th century.

Banana became popular and widespread when South East Asian immigrants took banana saplings to the Middle East and Africa. Portuguese merchants moved rarely found banana saplings to the northwest coasts of Africa, where it is most traded today, and to Canary Islands. Banana grew very easily in these regions making a very beneficial staple food for their poverty-stricken people.

WORLD BANANA PRODUCTION IS ABOUT 140 MILLION OF TONNES

LEADERS OF BANANA PRODUCING COUNTRIES

1 INDIA	2 CHINA	3 PHILIPPINES
27,5 million tonnes	12,5 million tonnes	8,5 million tonnes



According to Spanish history, Thomas De Berlanga, a priest who sailed to Caribbean Islands in 1516, first introduced banana to the Americas.

Banana can be cultivated only on the 30th parallel south and north, and is an easily accessed and sought-after fruit all around the world. Banana is the fifth most important product in the world after rice, wheat, corn and potato in terms of gross value. It ranks first among the other fruit types with a production of 140 million tonnes.

India is the largest banana producer with a production of 27 million 575 thousands tonnes, followed by China with 12 million 76 thousands tonnes and the Philippines with 8 million 646 thousands tonnes. Other banana producing countries are Uganda, China, Brazil, Ecuador and Indonesia. Although Ecuador ranks fifth in banana production, it has an export worth of almost 3 billion US dollars.

According to the world banana data, developed countries spend bigger budgets for banana. The EU countries, the U.S. and Japan are the biggest importing countries. Today, Canada produces 4 billions of lady finger bananas annually and Germany more than 2 billions. According to another research, 100 bananas are consumed per person in England, and this means 5 billion lady finger bananas.

Banana is the staple food for the people of Uganda. One Ugandan consumes 400 kilos of sweet and cooking bananas a year in average. Although there are many varieties of banana, these varieties could not be included in marketing networks. The most commonly traded variety in the world is cloned Cavendish.

Banana is consumed for its flavour and rich content, while it is the staple food in the third world countries where banana is largely produced.

One other member of the banana family is plantain, which can be cooked, is also becoming widespread around the world, but it is used as main meal in underdeveloped tropical countries.

Babies and children can also consume this nice smelling fruit since it has a special aroma, high nutritional content, easy consumption, and is easily mixed in liquids.

Both raw eaten and cooking bananas are rich sources of vitamins B1, B2, C, E, provitamin A, potassium, iron, calcium, phosphor, sodium and iodine. One banana has 100 calories in average.

Banana is a fruit type that can only be grown in tropical regions, and is prone to spoilage. The most advanced method of storing bananas is a type of controlled atmosphere storage, which has high airflow and allows for temperature, humidity and ethylene control.

Unlike the general assumption, it is harvested before it is ripened. Bunches of bananas are brought into the necessary size for trading and washed and dipped in fungicide before they are stored in cold storage at 12-15 °C depending on the variety, and with a humidity rate of 85-90%.

The respiration speed of bananas is higher than many other fruit types. Since storing temperature of this excited fruit is high, reducing the respiration speed is quite limited.

Bananas release ethylene gas during respiration. This gas accelerates its maturing. That is why the most critical factor in storing bananas is the level of ethylene in the storage.

If the ethylene gas cannot be removed through ethylene cleaners, it won't be possible to store bananas for a long time. Unfortunately, bananas are not suitable for long-term storage. Stored while they are still green, bananas have maximum 6-7 weeks of storage life, and cannot be sent to the market straight after storage. They are given ethylene in a controlled way in special rooms for breaking down the chlorophyll on the skin in order to change its colour to yellow in 6-8 days depending on the temperature. and then sent to the market.

It's a small miracle that this fragile and tasty fruit reaches our homes from all the way from the Equator. Those, who perform this miracle, are banana producers who sell a kilo for a few cents, genetic scientists who developed the banana varieties and cold storage experts who achieve storing bananas until they reach the consumer.

Products are presented in three parts in the books and documentary films.

FIRST PART describes the product extensively

SECOND PART describes the most advanced methods of product storage

THIRD PART displays the trading volume by analysing the production costs, processing and storage.

Why should you have this series of books?

If you are a producer or wish to invest in production, this series displays what should be done from the choice of land to processing products, time needed for all this process, costs and profits and how you will affect the environment.

If you own or have an interest on cold storage, they present the key points of storing surplus product with the use of the best methods and cutting edge technology.

If you have these books and documentaries as a consumer, you will find out that the products you buy do not grow arbitrarily in food chain, about the labour during the production, and direct and indirect impacts of incorrect investments on nature.

The solution to convey to the next generations should be 'producing a lot by using less'; this involves using more efficient sources or making wasted products by spoilage more durable.

For this reason, production alone does not suffice...

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Antalya Organize Sanayi Bölgesi

2.Kısım 21. Cd. No: 1 Antalya/Türkiye

tel: +90 242 258 17 00 (10 line)

fax: +90 242 258 17 09

www.cantekvakfi.org