

# TECH-KNOWLEDGE

The Official PMG Engineering Newsletter

The background image shows a hand holding a piece of brown cardboard with the words 'FOOD SAFETY' written on it in a bold, black, sans-serif font. The cardboard has a decorative, perforated edge. In the background, there are various kitchen items: a whisk, a wooden cutting board, two brown eggs in a white egg holder, and some cookies.

FOOD & BEVERAGE  
INDUSTRY

ENGINEERING  
& DESIGN

SCIENCE &  
TECHNOLOGY

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# FOOD SAFETY TRAINING AND ITS IMPORTANCE



## Introduction

Recent era has seen various food borne related disease breakout that has threaten the public health in global level. Anyone involved in processing or handling of food product, it is necessary to have Food Safety Training. And this is not mandatory from performance and competency viewpoint but rather it is legal complaint. It is a strategy wise, reason is simple, that no unskilled or untrained person should handle food products. Risk in the involvement of unskilled handlers is hygiene and quality issues. A person having no to low knowledge of handling process will make low quality, unhygienic product which can cause serious health issues to consumers. The good practices from training, prevents customers from suffering food poisoning and allergic reaction, minimize food waste and make food premises a pleasant and safe place to work.

It also needs to be kept in mind that there is no direct link between the training, knowledge, and practice. It is important that management supports training of their employees and the provided training is relevant to what everyday job role. The commercial advantage to any manufacturing firm have from having skilled and trained employee are competitive and profitable approach, high performance standard and production of safe and legally complained food product.

## Role of Management

Any food handling business looking for success, needs to give equal importance to food safety training as given to production. Management need to understand that failure in food safety lead to cost money, damage reputation and threaten long term health of business. Initiating and providing workers with food safety training is an effective way of letting them know about the food safety duties, which help in ensuring that food reaching customers are safe. An organization having trained workers and making aware of this fact to their prospective customers, make them feels confident about foods they eat. Employers need to understand the positive and necessary value of safety training program and hire trained workers or providing training to hired workers.

Practically it is very important to decide the length and area of training to get better result, as some might require more intense training, while a short brief to some might work depending on the engagement of employees to food manufacturing.

## How Food Safety Training Helps!

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**1.Reduction in Food Waste** -Production of quality product consistently, proves foods suitable for consumption. Training teaches proper handling of food product with minimum waste, saving time and money of manufacturer.

**2.Boosting Efficiency** -When staff knows nothing of hygienic handling of food there will be haphazard in the processing of food. Chaos will always lead to errors. Training to workers help understand and improve work activities among themselves, as a result efficiency is maintained.

**3.Faithful Customer** - When an organization works on building the good hygienic practices in facility, the superior quality of product itself open market and consumers tend to trust.

**4.Legal Compliance** - Law related to food safety requires that all handlers have sound knowledge of food safety related issues and how to combat the situation. How processing, storage, cleaning techniques, handling etc. in facility help reaching the required food safety.

**5.Limiting cross contamination** -It is highly possible that cases of cross contamination can be observed if the workers are not made aware of the issues related to cross contamination. Providing training shall help workers to avoid such incident.



## Responsibility of Food Safety Supervisor

Food Safety Supervisor is responsible for ensuring total compliance with all codes and standards of food safety. Keeping up with safety plan up to date and ensuring workers are keeping records. Planning is an important part of supervision. Identifying and performing checks for safety breaches in organization, and properly training all employees on food safety standards are also involved in the job description.

### NOTE:

It is important to link and associate training, area of training, duration, and practice of food safety in plant after training. This shall help and provide understanding to inconsistency on effectiveness of training on food handlers. Food safety training courses should focus on the area of work and need of employees. It is an important step in increasing understanding of the role of different food safety training components in determining the effectiveness of training on food handlers' knowledge and behavior.



# APPLICATION OF ULTRASOUND PROCESSING IN FOOD INDUSTRY



## Introduction

With increasing consumers demand for minimal processed food and tightening of food and environmental regulations, food manufacturers have lost their interest in traditional methods which gave rise to new and powerful technologies. Ultrasonic is a one of the fast, versatile, emerging, and promising non-destructive green technology used in the food industry from last few years to minimize processing, retain nutrient, non-nutrient (bioactive) and sensory characteristics and safeguard the safety of food products. Ultrasound finds applications in various areas of food technology namely crystallization, freezing, bleaching, degassing, extraction, drying, filtration, emulsification, sterilization, cutting, etc. It also acts as an effective tool for extending the shelf life of food products by inactivating the enzymatic activity and reducing microbial load.

## 1. Principal of Ultrasound Processing

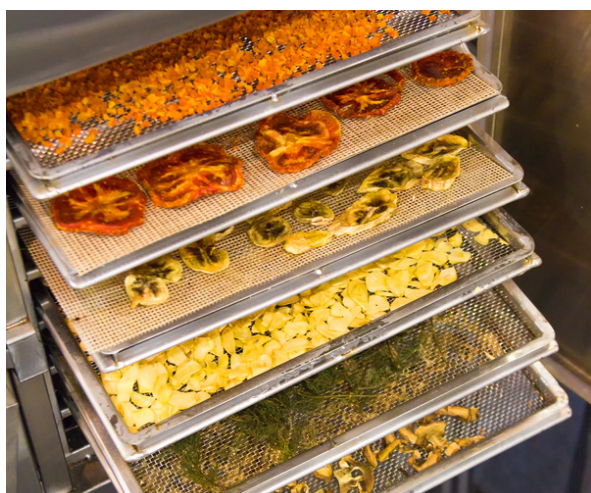
Application of ultrasound to liquid systems causes acoustic cavitation. This can be defined as the phenomenon of generation, growing and eventual collapse of the bubbles. Propagation of ultrasounds generates thermal, mechanical, and chemical effects in the liquid media due to bubble oscillation and collapse.

Mechanical effects include collapse pressure, turbulences, and shear stresses while the chemical effects include generation of free radicals. The effects in the cavitation zone generate extremely high temperatures (5,000 K) and pressures (1,000 atm) Depending on the frequency of the ultrasound, locally produced alternating positive and negative pressures cause expansion or compression of the material, resulting in cell rupture. Ultrasound causes hydrolysis of water inside the oscillating bubbles leading to formation of  $H^+$  and  $OH^-$  free radicals that can be captured in some chemical reactions e.g. free radicals can be scavenged by amino acids of the enzymes involved in structure stability, substrate binding, or catalytic functions.

## 2. Applications of Ultrasounds

**1. Acoustic Drying** - Conventionally food products are dehydrated using hot air. But usage of higher temperature during drying leads to product damage and induce undesirable alterations in its color, taste, and nutritional value. While on the other hand ultrasonic osmotic dehydration technology involves lower solution temperature resulting in higher water loss and solute gain rates. Sonic assisted drying is carried out at lower temperatures due to which probability of oxidation or degradation reduces in the material.

[READ MORE....](#)



**2. Acoustic Filtration** - It is also called as ultrasonically assisted filtration which is used to increase the flux by breaking the concentration polarization and cake layer formed on the surface of membrane without creating an effect on the permeability of membrane.

**3. Defoaming** - Foam is a colloidal system and is defined as a dispersion of gas in liquid. Intensive foaming or persistent foams are undesirable in various processes as it may lead to problems like loss of products, decrease in productivity etc. Traditionally, foams are controlled using mechanical breakers, lowering the temperature and by the addition of chemical antifoams.

**4. Meat Tenderization** - Many applications of ultrasonic treatment are reported in meat technology like, reduction of meat toughness due to large proportion of connective tissue. Tumbling the meat pieces by sonication or adding salt help in tenderization of meat.

**5. Acoustic Extraction** - Extraction of enzymes and proteins which are stored in cells and sub cellular particles are also processed by ultrasound. It is unique and effective application of high intensity ultrasound. It has potential benefit in the extraction and isolation of novel potentially bioactive components.

**6. Detection of Leakage in Packaging Material** - Ultrasound is used in bottling and filling machines for the online container leak testing of bottles and cans. The instantaneous release of carbon dioxide is the decisive effect of ultrasonic leakage of containers filled with carbonated beverages.



**7. Microbial and Enzyme Inactivation** - It is mainly used in the microbial and enzyme inactivation of fruit juices and sauces. Thermal treatment can cause undesirable alterations of sensory attributes i.e., texture, flavor, color, smell and nutritional qualities like vitamins and proteins. Ultrasound is an efficient non-thermal (minimal) processing alternative.

**8. Equipment Design and Analytical Operations** - Application of ultrasound in food science and technology for improving food quality has widened due to the probable recent advancement in electronics that designed ultrasound instruments and probes with greater convenience and resolution either as sensors (LPU) or as modifiers (high power ultrasound).

**9. Acoustic Cutting of food stuffs** - The most widely used application of ultrasound is the cutting of fragile food products. It involves a knife-type blade which is attached to a shaft linked to an ultrasonic source. The cutting tool can be considered as acoustic horn which is a part of ultrasonic resonating device.

**10. Emulsification/Homogenization** - It is a technique of delivering the hydrophobic bioactive compounds into different food products. Acoustic emulsifications have different improvement over the conventional methods. The emulsion produced from this technique has sub-micron distribution.

**11. To check crystallization of chocolate** - It is essential for monitoring the crystallization of the cocoa butter during the chocolate manufacturing process as it plays vital role in giving chocolates the desired gloss and texture.





# INDUSTRY BUZZ



## FSSAI updates its list of 11 labs considered to be the industry standard.

An updated list of 11 laboratories designated as "Reference Laboratories" by the FSSAI has been released. After the time of validity or recognition expired in June of this year, the Food Authority issued an order in this regard.

An MoU (Memorandum of Understanding) between the FSSAI and these laboratories will shortly be signed.

The ruling states that in compliance with Regulation 3 of the Food Safety and Standards (Recognition and Notification of Laboratories) Regulations, 2018, FSSAI has approved the food laboratories as National Reference Laboratories (NRL) for the areas listed alongside each NRL.

## The Ayush Ministry emphasizes that ASU facilities can be used to produce food items that are approved by the FSSAI.

Under specific restrictions, the Ayurveda, Siddha, and Unani (ASU) manufacturing facilities may be used to produce food products that have a license from the Food Safety & Standards Authority of India (FSSAI).

The clarification was made in response to queries the Ministry received from businesses looking for permission to produce goods under both Ayush and FSSAI in the same manufacturing facility, the Ministry stated in an office letter.

According to the Ministry, the Drugs and Cosmetics Act of 1940 and the Rules promulgated thereunder include no express limitation against using a combined manufacturing line and equipment to produce goods that have ASU and FSSAI licenses.







## How do new plant-based proteins compare to the flavor and texture of conventional meats

Researchers and food scientists are tirelessly pushing the boundaries of culinary creativity as the culinary landscape undergoes rapid change. The demand for sustainable and nourishing ingredients has increased alternative plant-based proteins, and environmental concerns and health considerations are taking precedence. The traditional distinction between meat substitutes derived from animals and those from plants is changing significantly due to advances that aim not only to mimic but also to exceed the flavors and textures of real meat. This article explores the most recent developments in plant-based proteins. It considers how to recreate the well-known typical meat texture and taste when customers are becoming more aware of the effects of their dietary choices.

## In Hyderabad, FSSAI and Herbalife will collaborate to hold the Eat Right Millet Walkathon.

With the help of the Telangana government, the Food Safety and Standards Authority of India (FSSAI), Herbalife India, and other partners organized the Eat Right Millet Walkathon 2023, a mighty mass awareness event.

The event occurred in Hyderabad's Jal Vihar Parking, near Necklace Road. The Eat Right Millet Walkathon 2023 was organized with the International Year of Millets 2023 to raise awareness of healthy eating practices and encourage people to incorporate millet into their diets to benefit from its many nutritious properties.



## Salam Kisan works with FPOs to offer farmers a drone-based spraying service.

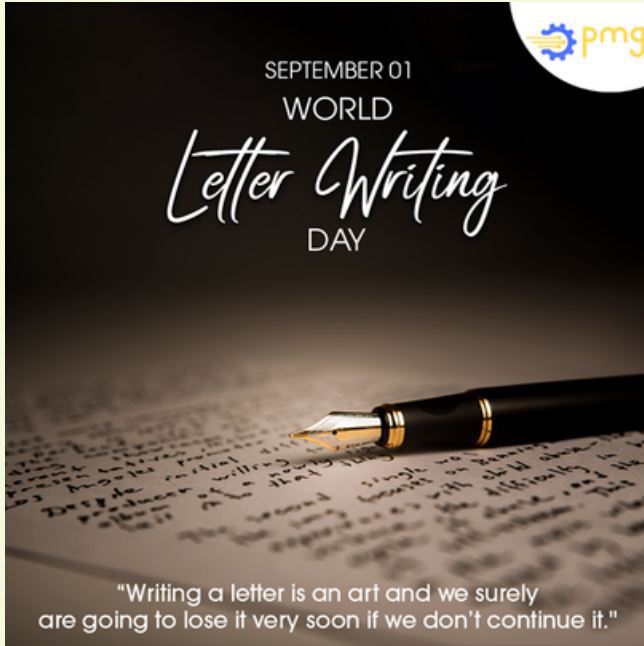
Salam Kisan, a rapidly expanding data-driven end-to-end agriculture platform in India that aids in boosting farmer productivity and profitability, introduces a first-of-its-kind drone-based spraying service through FPOs on a rental basis for farmers in the Chandrapur district of Maharashtra.

On Independence Day, during the Wild Vegetable Festival 2023, Cabinet Minister of State Sudhir Munagantiwar, Cabinet Minister of Finance & Planning, Forests in the Government of Maharashtra, unveiled this groundbreaking initiative and raised the flag of the country using a drone provided by the business. With this project, Salam Kisan hopes to provide farmers with cutting-edge technology to improve their farming methods, encourage sustainable resource use, and boost economic well-being.



# WEEKS HIGHLIGHT

NON-TECHNICAL CONTENT



1 SEPTEMBER

## **WORLD LETTER WRITING DAY**

Richard Simpkin established World Letter Writing Day in 2014 as a tribute to the happiness and anticipation he felt when a hand-written letter arrived in his mailbox. No better occasion then today to pick your pen, grab a paper and continue this old age art.



1-7 SEPTEMBER

## **NATIONAL NUTRITION WEEK**

National Nutrition Week promotes awareness about healthy eating, emphasizing balanced diets and good nutritional habits. It aims to educate individuals on making informed food choices and adopting a healthier lifestyle for overall well-being.

SEPTEMBER



2 SEPTEMBER

## WORLD COCONUT DAY

September 2nd is observed as World Coconut Day to commemorate the formation of Asian Pacific Coconut Community (APCC). These fleshy versatile drupes are rich source of electrolytes and lauric acid along with many antioxidants and antibacterial, anti-fungal, and antiviral properties being a perfect choice on a hot sunny day.



5 SEPTEMBER

## NATIONAL TEACHERS DAY

National teacher's day: Dr. Sarvepalli Radhakrishnan's birthday, September 5, is commemorated each year in India with Teachers' Day. He was a Bharat Ratna winner, academic, and former president of India. This day serves as a reminder of the crucial role that educators play in molding the nation's sharpest brains.





6 SEPTEMBER

### KRISHNA JANMASTHAMI

Janmashtami is a significant Hindu festival celebrating the birth of Lord Krishna, an avatar of Lord Vishnu. On Janmashtami, may the divine blessings of Lord Krishna fill your life with joy, love, and prosperity. May you find the strength to follow his teachings of righteousness and compassion. Happy Janmashtami!



7 SEPTEMBER

### INTERNATIONAL DAY OF CLEAN AIR

The International Day of Clean Air is a global initiative dedicated to raising awareness about the importance of clean air for our health and the environment. On this day, communities, organizations, and governments come together to promote clean energy, reduce air pollution, and advocate for policies that safeguard the air we breathe. It serves as a reminder of our collective responsibility to protect the planet and ensure a healthier future for all.

# DID YOU KNOW?

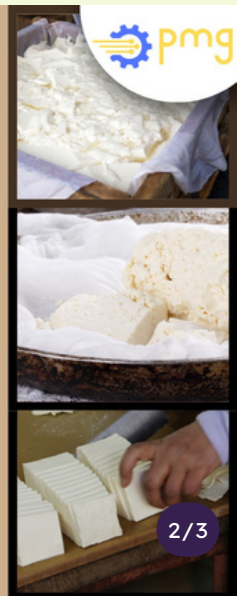


## COAGULANTS IN TOFU MAKING

Made from soy milk by a process that involves coagulating the proteins in the milk and then pressing the resulting curds into blocks. Tofu has a subtle flavor and a versatile texture, making it a staple ingredient in various cuisines, especially vegetarian and vegan diets.

### Working

- Responsible for curdling the soy milk and forming the solid curds that eventually become tofu.
- They cause the proteins in the milk to undergo a process called denaturation. Denaturation leads to the unfolding and rearrangement of protein molecules. As the proteins interact and bind together, they start to cluster and form curds.
- The choice of coagulant affects the taste, texture, and nutritional content contributing minerals like calcium or magnesium of the tofu.



## Types

### 1. Traditional Coagulants:

#### 1. Nigari (Magnesium Chloride):

- A natural mineral-rich substance extracted from seawater that contains magnesium chloride and other minerals.
- Commonly used in traditional Japanese tofu-making, it imparts a slightly bitter taste to tofu and produces a delicate texture.

#### 2. Gypsum (Calcium Sulfate):

- A naturally occurring mineral often used in Chinese-style tofu. Gypsum creates a firmer texture compared to nigari and has a neutral flavor.

### 2. Modern Coagulants:

#### 1. Calcium Sulphate Solution:

- Calcium sulfate solution can be used in liquid form to coagulate soy milk. It provides good curd formation and texture.

#### 2. Glucono Delta-Lactone (GDL):

- A slow-acting acid often used as a coagulant in the production of silken or soft tofu. It gradually lowers the pH of the soy milk, causing it to curdle.

### Fact 1

Coagulants are vital in tofu making, inducing curd formation by bonding proteins and fats in soy milk. Calcium-based options like nigari and gypsum, along with acid coagulants, alter texture and flavor, shaping the distinctive qualities of the final tofu product.



## COLD PRESSED OIL



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Cold-pressed oil refers to edible oils that are extracted from seeds, nuts, or fruits using a mechanical process known as **cold pressing**. This method involves applying pressure to the raw material without the use of heat or chemical solvents.

- The term "cold-pressed" indicates that the extraction process occurs at a temperature that is typically lower (40-50°C (104-122°F)) than the temperatures used in conventional oil extraction methods, which often involve heat and chemical treatments.

2/5

## Processing



### 1. Cleaning and Preparing

- The raw material is cleaned and prepared to remove dirt, debris, and any foreign materials.

### 2. Crushing or Grinding

- Cleaned raw materials are then crushed or ground to create a coarse paste.
- It increases the surface area and facilitates oil extraction.

3/5

### 3. Pressing

- The crushed or ground material is placed in a hydraulic or screw press, which applies mechanical pressure to extract the oil.

### 4. Filtering

- Extracted oil may undergo additional filtration to remove any remaining impurities or particles, resulting in a clearer and purer oil.

### 5. Storage and Packaging

- Cold-pressed oils are best stored at temperatures ranging from 50°F to 70°F (10°C to 21°C).
- Further packaging helps protect the oil from light, heat, and air, which could degrade its quality.

4/5



## Benefits

- Higher Nutrient
- Rich in Essential Fatty Acids
- Antioxidant Properties
- Natural Flavor and Aroma
- Environmentally Friendly

## Disadvantage

- Lower Yield
- Slower Process
- Sediment and Cloudiness
- Flavor and Aroma Variability
- Nutrient Losses

5/5

### Fact 2

Cold-pressed oil is a healthier choice, as it's extracted from seeds or nuts without exposing them to high heat, preserving their natural nutrients and flavor. This gentle extraction method retains essential fatty acids and antioxidants, making it a superior option for cooking and skincare. Its purity and quality make cold-pressed oil a top pick for those seeking a wholesome and natural dietary supplement.



## FERMENTED FOODS AS FUNCTIONAL PROBIOTICS

1/4

Functional probiotics refer to live microorganisms primarily bacteria and some yeasts that, when consumed in appropriate amounts, confer health benefits beyond basic nutrition.

Ex: Lactic Acid Bacteria, Saccharomyces boulardii, Streptococcus thermophilus, Bacillus coagulans etc.

### Fermented foods are rich sources of functional probiotics

- These foods undergo a natural fermentation process where beneficial bacteria, yeasts, or fungi break down the components of the food, leading to the production of various compounds, including probiotics.
- Probiotics contribute to gut health and have been associated with a range of other health benefits.



2/4



## Common Examples

### Yogurt

Made by fermenting milk with specific bacterial strains such as *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

### Kefir

Made by fermenting milk with kefir grains, which consist of a mixture of *lactic acid bacteria* and yeasts.

### Sauerkraut

Fermented cabbage that is typically made by *lactic acid bacteria* and rich in vitamins, minerals, and fiber.

### Kimchi

Traditional Korean fermented vegetable dish, usually made from napa cabbage and a variety of spices.

### Miso

Japanese seasoning made by fermenting soybeans with salt and koji (a type of fungus), often used to make soups and sauces.



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### Tempeh

Fermented soy product originating from Indonesia and made by fermenting cooked soybeans with a specific fungus called *Rhizopus oligosporus*.

### Kombucha

Fermented tea beverage produced by fermenting sweetened tea with a symbiotic culture of bacteria and yeast (SCOBY).

### Pickles

Made from cucumbers or other vegetables, can be fermented using *lactic acid bacteria*.

### Fermented Cheese

Some varieties of cheddar, gouda, and Swiss, undergo fermentation processes that involve probiotic bacteria.



4/4

### Fact 3

Fermented foods are a rich source of functional probiotics, offering numerous health benefits. Through natural fermentation processes, beneficial bacteria thrive, enhancing gut health and aiding digestion. These probiotics strengthen the immune system, improve nutrient absorption, and may even boost mental well-being. Incorporating fermented foods into your diet can promote overall health and vitality.

## TANKS USED IN FOOD PROCESSING



1/5



A container or vessel designed to hold and store various substances, ingredients, or products used in food processing. Tanks in the food industry are made from food-grade hygiene materials such as stainless steel, they come in various shapes and sizes to suit the specific needs of different processes.

- Tanks can be customized based on the specific requirements of the food factory, including factors like the layout of the production area and the types of products being processed.

2/5

## Types

### 1. Storage Tanks

Used to store raw materials, ingredients, and finished products.

### 2. Mixing and Blending Tanks

Used for mixing and blending ingredients to create homogeneous mixtures.

### 3. Fermentation Tanks

Food and beverages like yogurt, cheese, beer, and wine, tanks are used to provide a controlled environment for the growth of microorganisms.

### 4. Cooking and Heating Tanks

Employed for cooking, pasteurization, and heating processes and designed to withstand high temperatures to ensuring that food products are properly cooked



3/5

### 5. CIP (Clean-In-Place) Tanks

Used for the cleaning of equipment and tanks without disassembling them.

### 6. Cooling and Chilling Tanks

Used to quickly lower the temperature of food products using chilled water or refrigerants.

### 7. Aging and Maturation Tanks

Certain food items like cheese, wine, and spirits, aging tanks are used to allow the product to mature and develop flavors over time.



4/5

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## Fact 4

Tanks play a vital role in food processing, facilitating storage, mixing, and fermentation of various ingredients. They are used for storing raw materials, intermediate products, and final goods, enhancing efficiency and meeting hygiene standards in the food industry while providing a controlled environment.



# FOOD ADDITIVES

General provisions and staple foods



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Food additives are substances added to food products during production to enhance the flavor, texture, appearance, or shelf-life of General provisions and Staple foods.

- They can be natural or synthetic and are used in varying amounts depending on the type of specific product being made and the desired effect. Food additives used in General provisions and Staple foods include preservatives, antioxidants, emulsifiers, stabilizers, thickeners, flavor enhancers, and colorants.
- Food safety authorities regulate food additives to ensure that they are safe for consumption and do not pose a health risk to consumers. Depending on their potential health risks, some additives may be restricted or banned in certain countries.

## Market scope

The market for food additives in general provisions and staple foods is highly competitive, with many players operating in the industry. Some of the major players in the market for food additives in general provisions and staple foods include:

- Cargill Inc.
- Archer Daniels Midland (ADM)
- DuPont de Nemours, Inc.
- Kerry Group
- BASF SE
- Tate & Lyle PLC
- Ingredion Inc.
- Corbion NV
- Chr. Hansen Holding A/S
- Givaudan SA



2/3

- These companies are involved in the production and distribution of a wide range of food additives used in the food industry, such as preservatives, coloring agents, flavorings, emulsifiers, and stabilizers. They often have global operations and supply chains, with a focus on product innovation, quality control, and sustainability.

## Commercial production

- The commercial production of food additives involves the use of specialized facilities and equipment, as well as strict quality control measures to ensure that the additives meet regulatory requirements and are safe for human consumption.
- The production process typically involves sourcing raw materials, conducting various chemical reactions to create the desired additives, purifying the additives, and then packaging and labeling them for distribution.
- Food additive manufacturers must comply with regulations set by the government, such as the Food and Drug Administration (FDA) in the United States, which requires that all food additives be tested for safety and effectiveness before they can be approved for use in food products.



FOOD ADDITI

3/3

## Fact 5

Food additives are substances added to food products to enhance their taste, appearance, texture, or shelf life. While many are safe and regulated, some may pose health concerns if consumed in excess. It's essential to read labels and make informed choices when selecting foods to ensure a balanced and healthy diet.



### General provisions foods

Refers to essential food items commonly used in a household's pantry. These include:

1. Flour
2. Sugar
3. Salt
4. Cooking oil
5. Vinegar
6. Soy sauce
7. Spices

### Staple foods

Staple foods form the foundation of a diet and are consumed regularly. These include:

1. Rice
2. Wheat
3. Corn
4. Potatoes
5. Beans
6. Meat
7. Fish
8. Vegetables



### Market Scope

- The market scope for general provisions and staple foods is significant as they are essential items used regularly in households and the food industry.
- The market for staple foods is expected to grow steadily in the coming years due to population growth, increasing urbanization, and changing dietary habits.
- General provisions is also expected to grow as consumers continue to cook and bake at home, especially after the COVID-19 pandemic, which has increased demand for baking and cooking ingredients.
- General provisions and staple foods is diverse and includes many players, from large multinational corporations to small local producers.



### Fact 6

General provisions in food regulations typically cover aspects like labeling, safety standards, and additives. Staple foods, like rice, wheat, and maize, are vital dietary components worldwide. Regulations ensure their quality and affordability. These provisions aim to safeguard public health and ensure fair trade practices, promoting food security and consumer confidence in staple foods, which are fundamental to global nutrition and agriculture.





PMG ENGINEERING

# About PMG

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Food & Beverage Industry



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