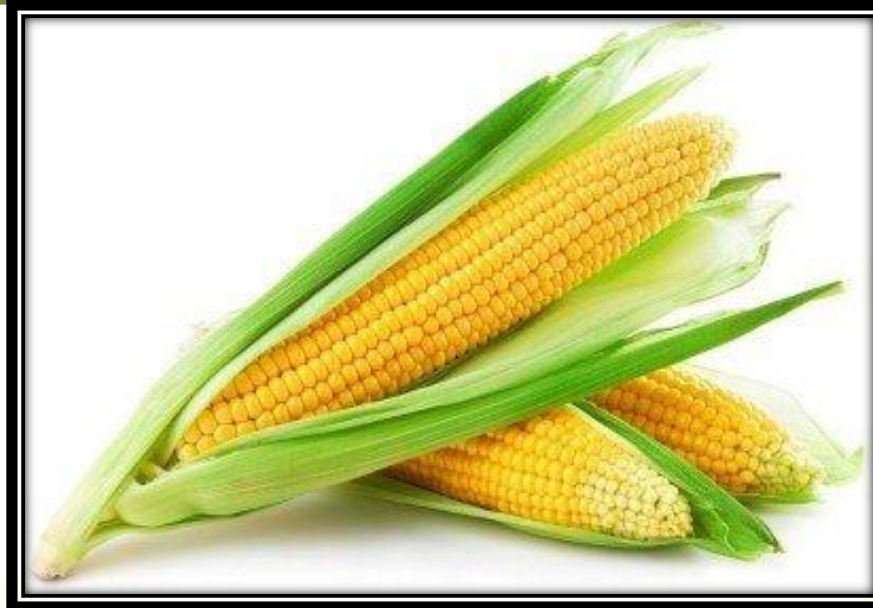


## SWEET CORN - PROCESSING



**AATMANIRBHAR BHARAT**

PM Formalisation of Micro Food Processing  
Enterprises Scheme (PM FME Scheme)

# INTRODUCTION

## CEREAL GRAINS



- ❖ Cereal grains (or simply grains) are small, hard and edible dry seeds that grow on grass-like plants called cereals.
- ❖ They are a staple food in most countries, and provide more food energy worldwide than any other food group, by far.
- ❖ Grains have played a major role in human history, and grain agriculture is one of the main advancements that fueled the development of civilization.
- ❖ They are eaten by humans, and also used to feed and fatten up livestock. Then grains can be processed into various different food products.

# INTRODUCTION




- ❖ Cereals form a major portion of human diet and are an important source of starch and other dietary carbohydrates (dietary fibre), which play an important role in the energy requirement and nutrient intake of human.






# TYPES OF CEREAL GRAINS

IMAGE	NAME	DESCRIPTION
	<b>Rice (<i>Oryza sativa</i>).</b>	Rice is an excellent source of calories because of its starch content. It contains 75-80% of starch, 7% of protein, 0.4-0.8% of lipids and 12% of water. Rice oats protein is of highly digestible quality and contains lysine 4.1mg/100g of protein higher than wheat.
	<b>Barley.</b>	It is highly nutritious and important for malting. Mostly used as a breakfast cereal with oat, it is also used as a feed for animals. It is mostly grown on land which is not capable of growing wheat.

# TYPES OF CEREAL GRAINS

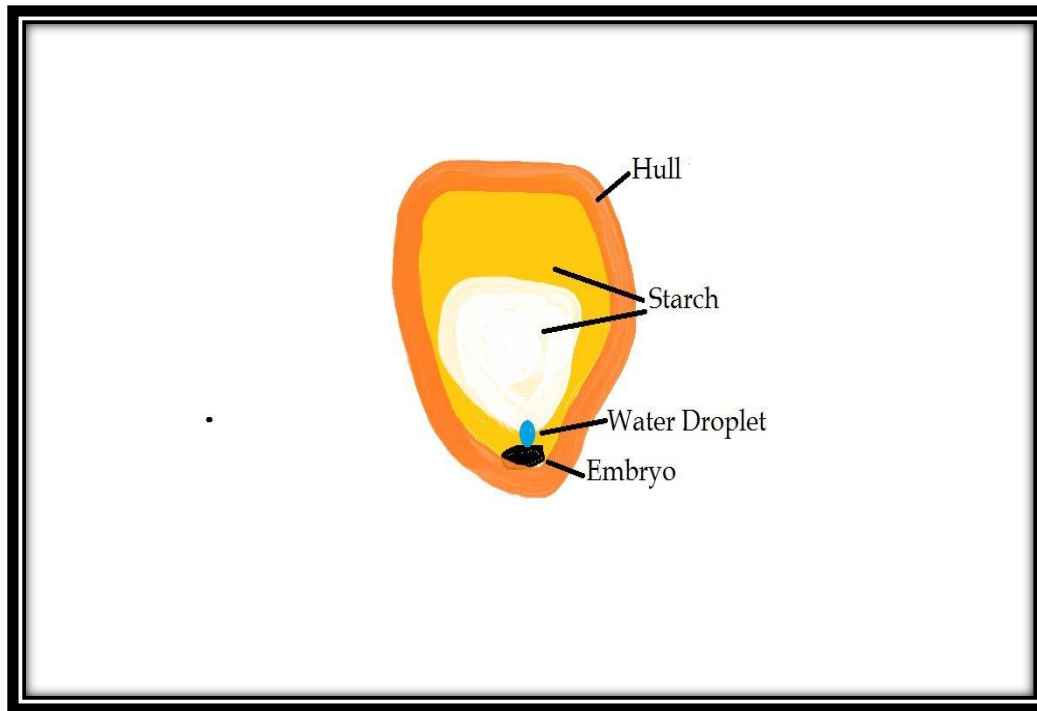
IMAGE	NAME	DESCRIPTION
 A close-up photograph of sorghum grain, showing a cluster of small, golden-brown, oval-shaped grains with a slightly textured surface.	<b>Sorghum</b>	Highly nutritious and used as a feed for livestock.
 A close-up photograph of millet grain, showing a large quantity of small, light-colored, oval-shaped grains with a smooth surface.	<b>Millet</b>	Mostly grown Asia and Africa, wheat porridge is popular in China, Russia and Germany. It can also be used to make alcoholic beverages, as an animal feed and bird feed.
 A close-up photograph of rye grain, showing a large quantity of small, light-colored, oval-shaped grains with a smooth surface.	<b>Rye</b>	The cereal grain of cold climates, used for making beer, breads, whiskeys, vodka and also use as animal fodder.

# TYPES OF CEREAL GRAINS

IMAGE	NAME	DESCRIPTION
	<b>Oats</b>	Due to high content of fibre it is popular to reduce weight and for lowering blood sugar level.
	<b>Wheat</b>	Wheat is a major cereal crop and one of the oldest domesticated grains. In modern times, wheat is used to produce meal, breakfast cereals, and oats for bakery products.
	<b>Maize</b>	Corn is a staple cereal in continents like South America and Africa, and used as an animal feed worldwide. Cornflakes are also a popular cereal globally.

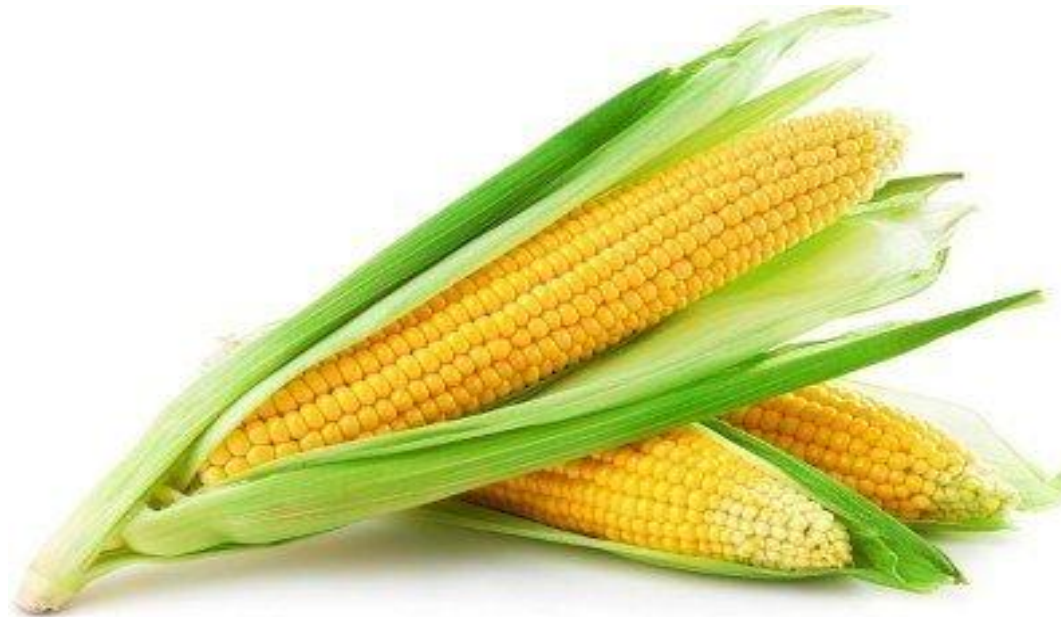
# SWEET CORN

- ❖ Corn kernels are the fruits of corn (called maize in many countries). Maize is a grain, and the kernels are used in cooking as a vegetable or a source of starch. The kernel comprise endosperm, germ, pericarp, and tip cap. One ear of corn contains roughly 800 kernels in 16 rows.



# SWEET CORN

- ❖ The outer layer of the kernel comprised of pericarp, a component of seed coat. The thickness of the layer determines the kernel skin level of tenderness. This feature is important for the estimation of kernel quality for processing. The thickness of pericarp in sweet corn ranges from 25-30 $\mu$ m.

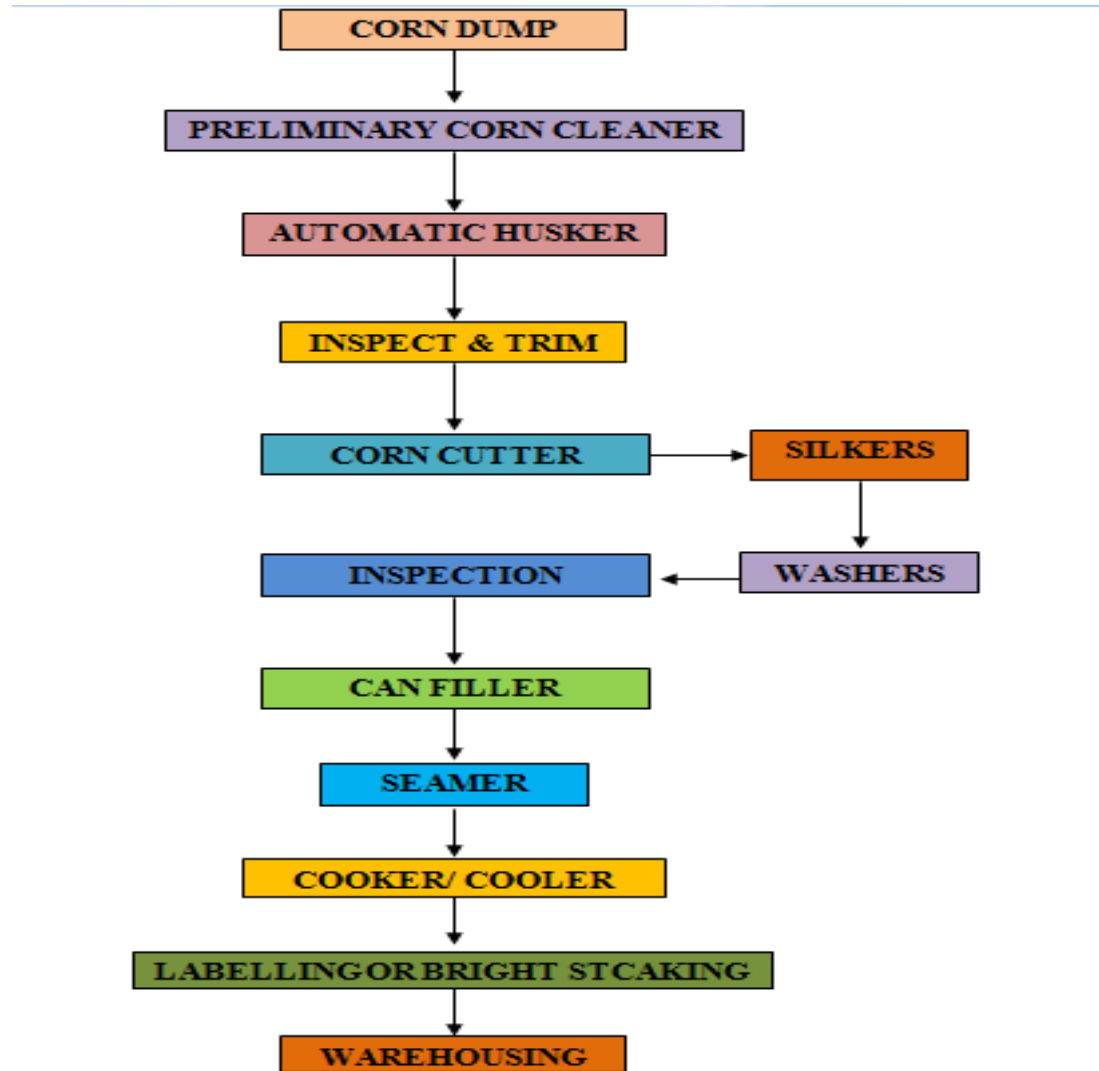




## NUTRITIONAL VALUE OF SWEET CORN

Components	Value
Calories	90 Kcal
Calories from Fat	20g
Total Fat	2.5g
Potassium	250mg
Total Carbo-hydrate	18g
Dietary Fiber	2g
Sugars	5g
Protein	4g

# SWEET CORN PROCESSING



# SWEET CORN PROCESSING

- ❖ **HARVESTING** : Harvesting of corn is done after proper maturity and the entire ear with the husk on is taken to the canning plant by truck. Before dumping the corn to the dump pad it is properly weighed. Delay should be avoided in processing of corn otherwise it may affect the sweetness of corn.
- ❖ **CLEANING** : A conveyor in the dump pad moves the corn to the preliminary corn cleaner where loose husks and stalks are removed by high velocity air.
- ❖ **HUSKING** : Husk removing of corn is done with the help of husking machine. There are two types of husking machine one is automatic butting and nonbutting huskers. Non butting husker are mostly used due to less generation of waste. Husking machine preferred over manual removal of husk because they do little injury to the corn.

# SWEET CORN PROCESSING

- ❖ **SILKING** : Silking is performed as a separate operation by running the corn through a special machine that rolls the ear rapidly between a pair of rollers and at the same time brushes it with fibre brushes as the ear advances. Sprays of water are introduced at the same time, which wash away the silk and clean the ears.
- ❖ **INSPECTION** : When the corn is properly washed and moving toward the cutter then it is inspected on a moving belt. The ears which are not suitable for canning processing are removed.
- ❖ **CUTTING**: Cutting is done with the help of knives, which should be sharp enough to avoid group pulling of kernel. The depth of cutting should be deep to take out most of the kernel, yet not cut into the cob.

# SWEET CORN PROCESSING

- ❖ **WASHING OF CUT CORN :** Washing of corn is an important stage to remove microbial load and preventing the product from spoilage. Efficient types of washers are made especially for this purpose. If some flotation type of washer is used, this should be followed with a spray wash using fresh water at 82–93°C (180–200 °F), which not only aids in the reduction of contamination, but also removes the chill from the corn.
- ❖ **FILLING AND BRINING :** In order to remove air from the cut kernels it is helpful to blanch the kernels in hot water or exhaust the filled cans before closure. The inspected kernels are then transferred to filling machines, similar to or identical with the ordinary pea filler, filled into cans, and brined with boiling hot water or a weak salt brine. When salt is used, the amount may be as little as 0.5%, but the average is approximately 2%.

# SWEET CORN PROCESSING

- The brine should be added at or near the boiling temperature to accomplish an initial temperature of from 60 to 71°C (140–160 °F) in the can.
- ❖ **SEAMING:** Seaming is done to pack the mouth of can and then send for next process.
- ❖ **RETORT :** The time and temperature of retort varies as per the size of the can, larger will the can, more time will required for the retort process. For example a can with 170g fill required at least 42 minutes at 116°C, 27 minutes at 118°C and 18 minutes at 121°C where a can with 340g fill required 52 minutes at 116°C, 36 minutes at 118 °C and 26 minutes at 121 °C.

# EQUIPMENT FOR SWEETS CORN PROCESSING

- ❑ **HUSKING MACHINE** : Corn husking machine is used to remove the husk of the corn.

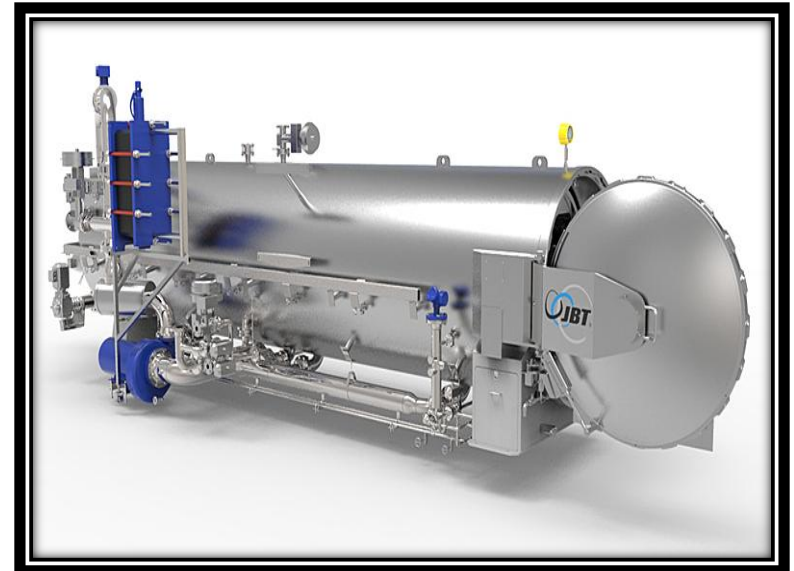


# EQUIPMENT FOR SWEETS CORN PROCESSING

- ❑ **DE SILKING MACHINE :** This machine is used for the removal for silk from the corn.



- ❑ **RETORT :** Retort is used for sterilization of can so that microbial load can be reduced.





# EQUIPMENT FOR SWEETS CORN PROCESSING

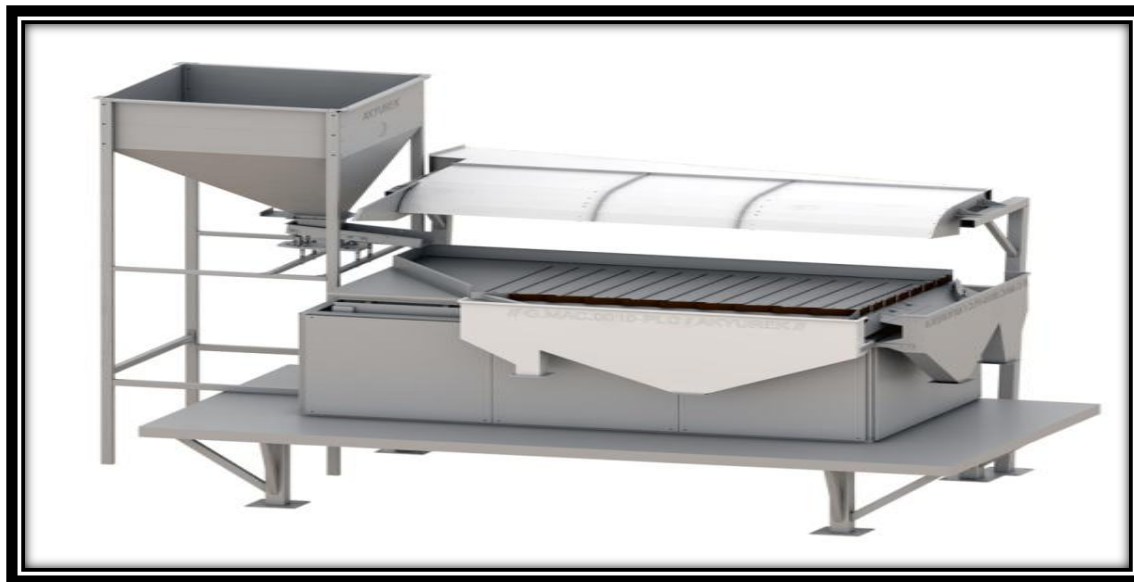
## ❑ CORN KERNEL REMOVER MACHINE :

Removing of kernel from cob is an important steps in processing which is done with help of kernel remover machine. Kernel is separated in well manner to avoid any kind group pulling.



# EQUIPMENT FOR SWEETS CORN PROCESSING

- ❑ **GRAVITY SEPARATOR:** Gravity separator machine may be used to separate any type of dry bulk particles that are similar in size and shape but differs in weight. Gravity separator are suitable for processing of the seeds of corn, Wheat, rice, soybean, sorghum, various vegetables and other agricultural and sideline products.



# EQUIPMENT FOR SWEETS CORN PROCESSING

- ❑ **FOOD GRADE CONVEYOR:** These are conveyors with food grade belt to maintain food safety standards set by monitoring authorities.



# EQUIPMENT FOR SWEETS CORN PROCESSING

## ❑ OTHER MATERIAL AND HYGIENE

**EQUIPMENT :** They are simply used to hold and transfer the given material efficiently.



## ❑ POWER DISTRIBUTION EQUIPMENTS :

They are used to safely receive and distribute power.



## MARKET POTENTIAL

- ❖ The global Sweet Corn Seed market size is expected to gain market growth in the forecast period of 2020 to 2025, with a CAGR of 3.1%% in the forecast period of 2020 to 2025 and will expected to reach USD 825.7 million by 2025, from USD 731 million in 2019.
- ❖ The total value of the 2016 sweet corn crop was nearly \$9 million. Of that amount, 74 percent was produced for the fresh market and 26 percent for the processing market. Processing sweet corn production (both frozen and canned) in 2015 totaled 2.5 million tons with a crop value of \$255.5 million (NASS 2017).

# MARKET POTENTIAL

- ❖ In terms of production and value, sweet corn is the second largest processing crop, surpassed only by tomatoes. Processing sweet corn production (both frozen and canned) in 2015 totaled 2.5 million tons with a crop value of \$255.5 million. (NASS 2017).
- ❖ Direct market opportunities vary by region and production capabilities. These are typically in-season, point-of-sale markets either at on-farm stands, farmers' markets or direct delivery to retailers.



# SOME FAMOUS MARKET PLAYER IN SWEET CORN INDUSTRIES



# HEALTH BENEFITS

- ✓ Corn has several health benefits. Because of the high fiber content, it can aid with digestion.
- ✓ It also contains valuable B vitamins, which are important to your overall health.
- ✓ Corn also provides our bodies with essential minerals such as zinc, magnesium, copper, iron and manganese.
- ✓ Corn is a good source of the antioxidants carotenoids, lutein and zeaxanthin, which promote eye health.





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