



MAIZE PROCESSING



AATMANIRBHAR BHARAT

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

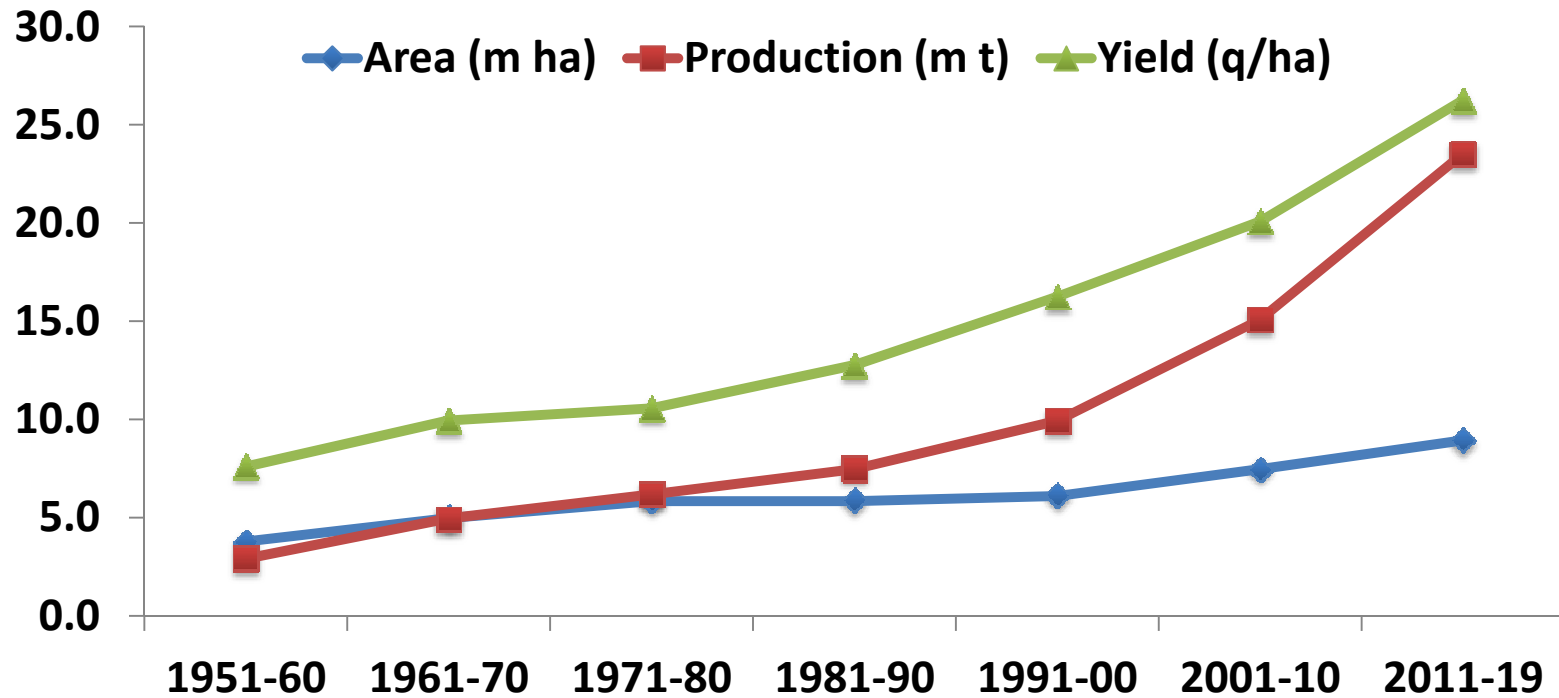


MAIZE/CORN

- ❖ World no. 1 & India ranked 3rd
- ❖ Diverse type: SC, BC, PC, QPM, etc
- ❖ Diversified food products
- ❖ Health cautious food for nutritional security & vulnerable society
- ❖ Can be grown round the year
- ❖ Raw material available whole year
- ❖ Today maize has turned industrial crop
- ❖ Value added products export potential
- ❖ Employment generation
- ❖ Revenue generation and forex earning



MAIZE AVAILABILITY IN INDIA ENHANCED SIGNIFICANTLY



Maize is no. 1 in productivity and no. 3 in production in India



सत्यमेव जयते



MAIZE PRODUCTION ENHANCEMENT NEEDED FOR INDIA

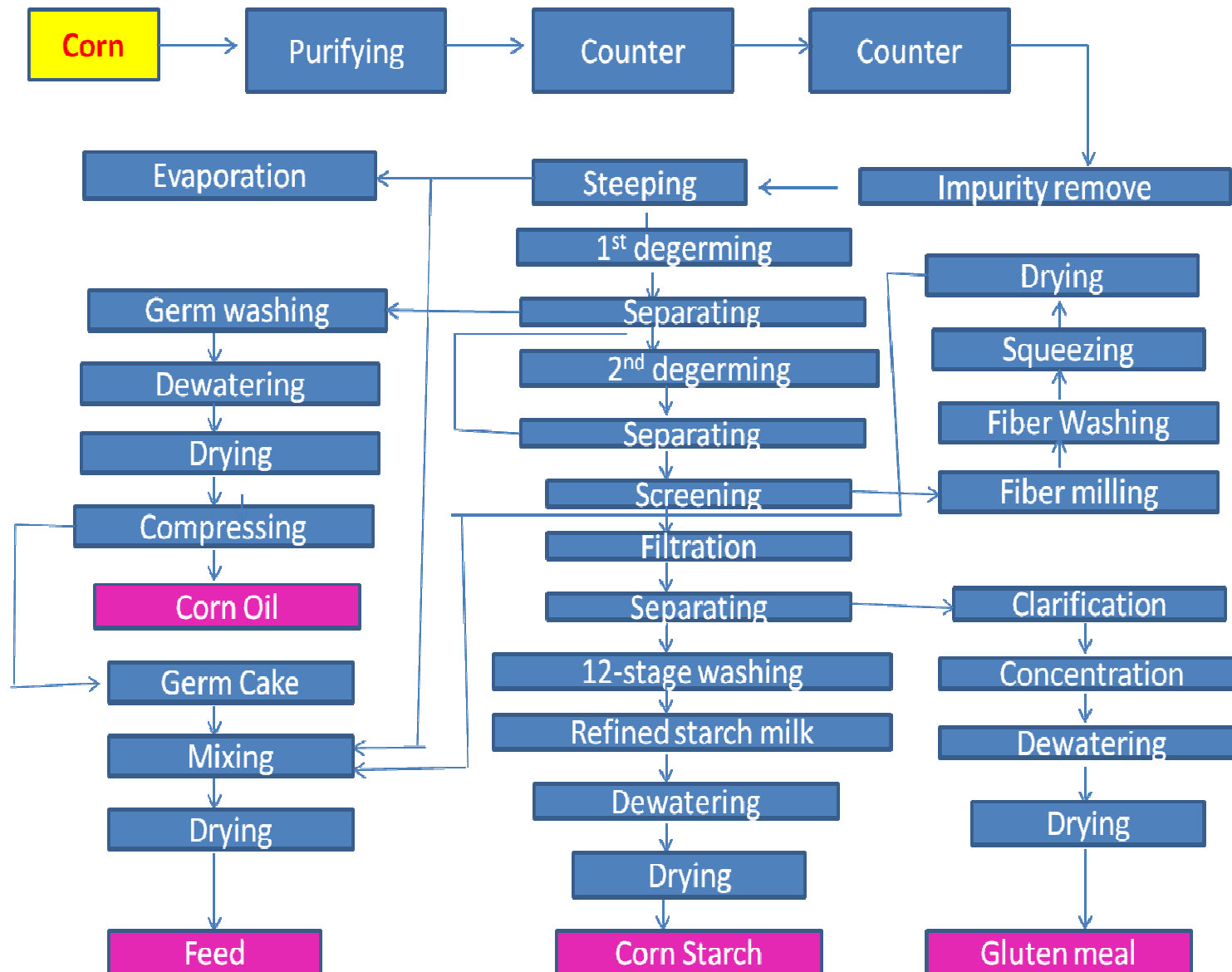
- No more demand of other crop
- Climate change resilient and natural resource efficient
- Most diverse uses in the present and future
- Ethanol for future energy security
- Carbon trading
- Easier production technology
- Demand of value added products: national and international market; starch, chips, feed, baby corn, etc
- Highest yield potential suited to climate change and natural resource saving crop.
- Advantage of market demand nationally and internationally



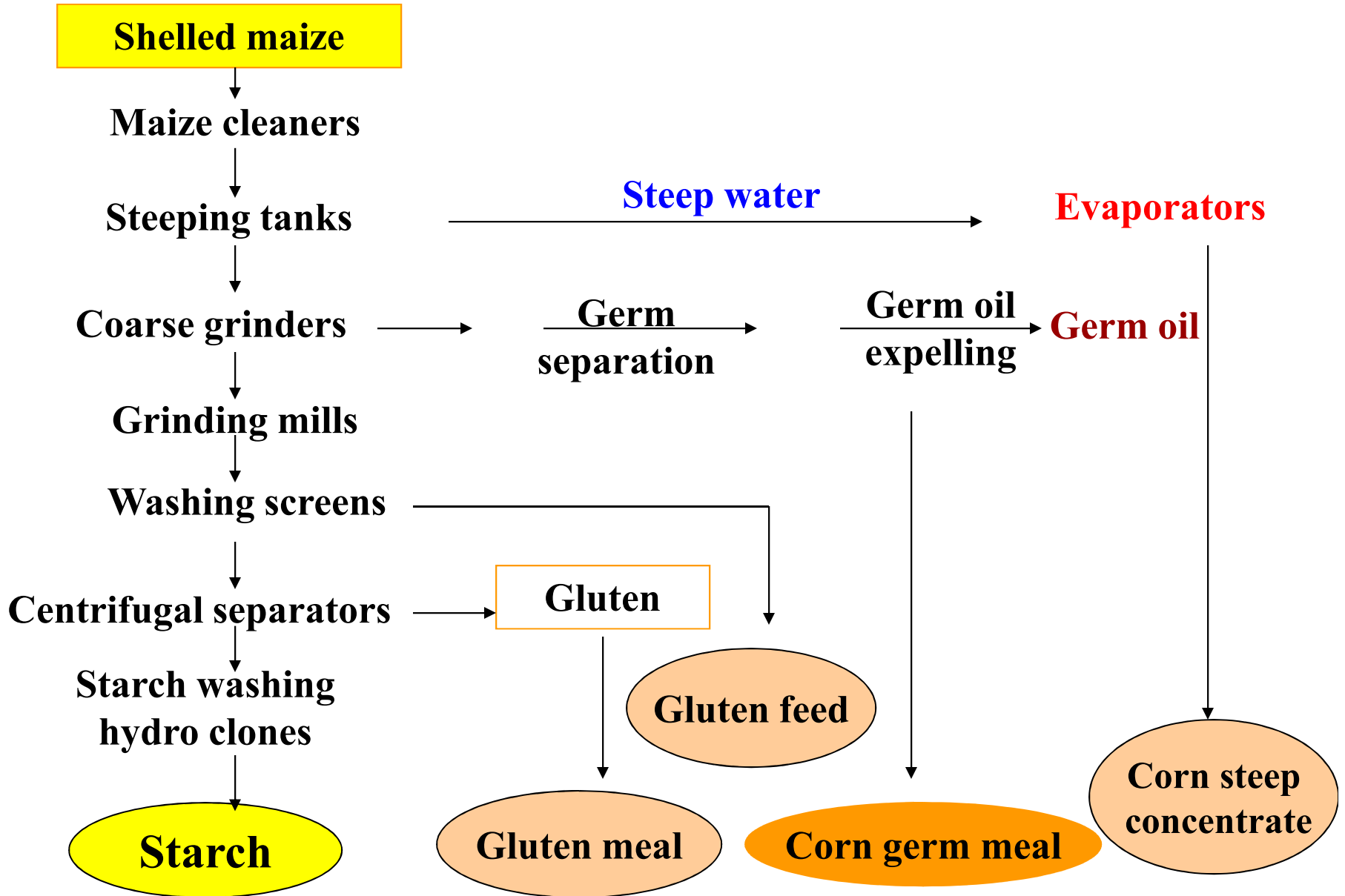
MAIZE EXPORT FORM INDIA

- 140 countries maize export, major are USA(~40%), Brazil (13.5%), Argentina (13.4%) and Ukraine (12.4%)
- Indian export was at peak in 2012-13
- It can be increased again by production enhancement as importing countries are in our vicinity like Bangladesh, Nepal, Vietnam, Indonesia, Malaysia, Sri Lanka, Bhutan, Myanmar, China, Thailand, etc

MAIZE STARCH INDUSTRY: PROCESSING



MAIZE PROCESSING: STARCH INDUSTRIES





USES OF CORN STARCH

- ❖ Corn starch powder: soups, sauces, gravies & custard
- ❖ Liquid glucose: to keep food products soft and fresh
- ❖ High Maltose Corn Syrup (HMCS): sweetener & preservative
- ❖ Dextrose Monohydrate : food industry
- ❖ Maltodextrine : pharmaceutical & confectionery industries as coating material





CORN STARCH IN FOOD INDUSTRY

- ❖ Thickening sauces, gravies, puddings and pie fillings
- ❖ Makes hard wheat flour preferred for cakes
- ❖ To give proper strength to ice cream cones
- ❖ Syrups & artificial honey
- ❖ Moisture holding agent in breads
- ❖ Dispersing agent in instant drink concentrates





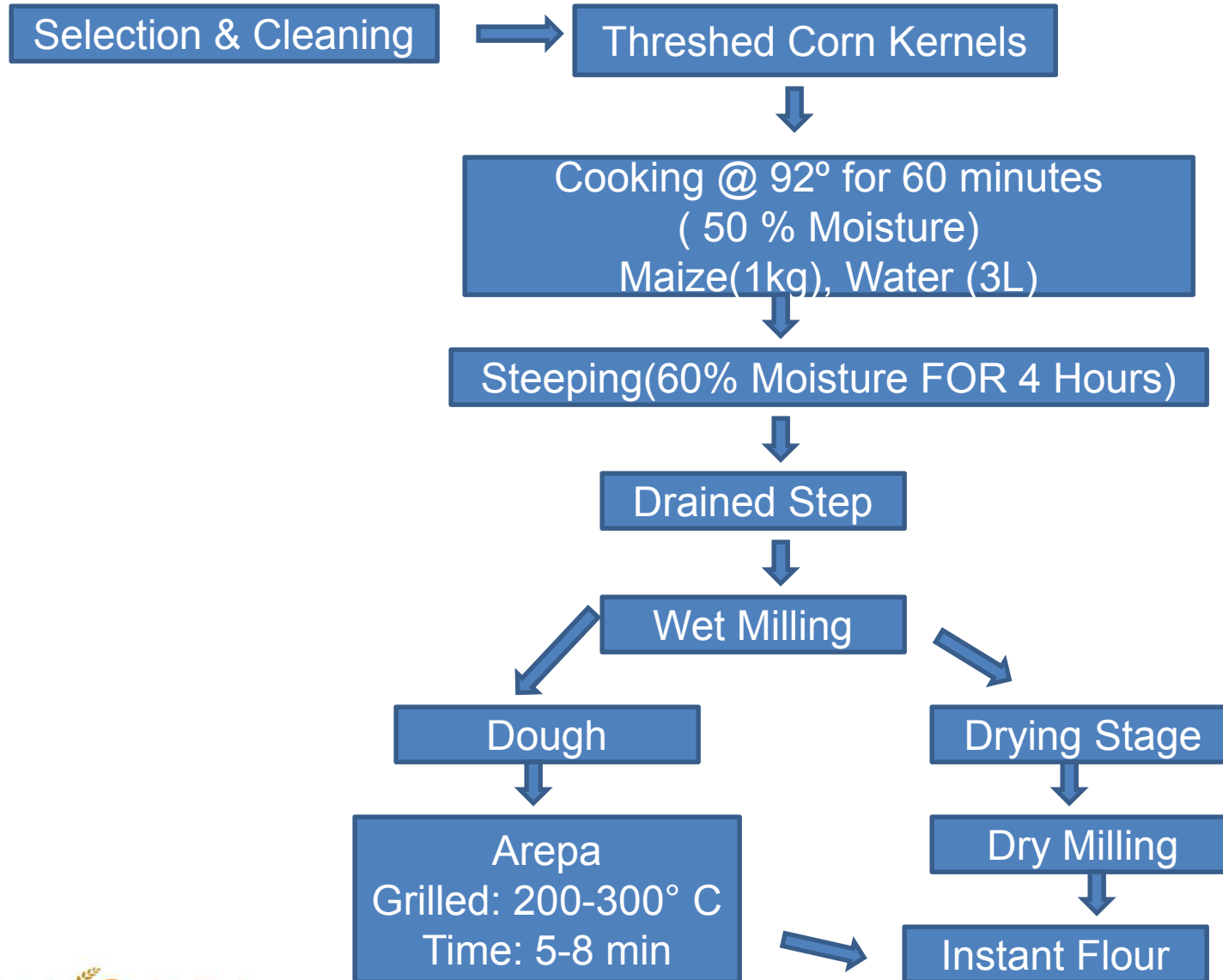
CORN FLOUR

- ✓ Bakery Dusting
- ✓ Breads and Batters
- ✓ Pancake and Waffle Mixes
- ✓ Beverages, Alcohol
- ✓ Confectionery Toppings
- ✓ Confections
- ✓ Baby Foods
- ✓ Snacks, Cereal



India exports corn flour to South Korea, Thailand and Angola

CORN FLOUR



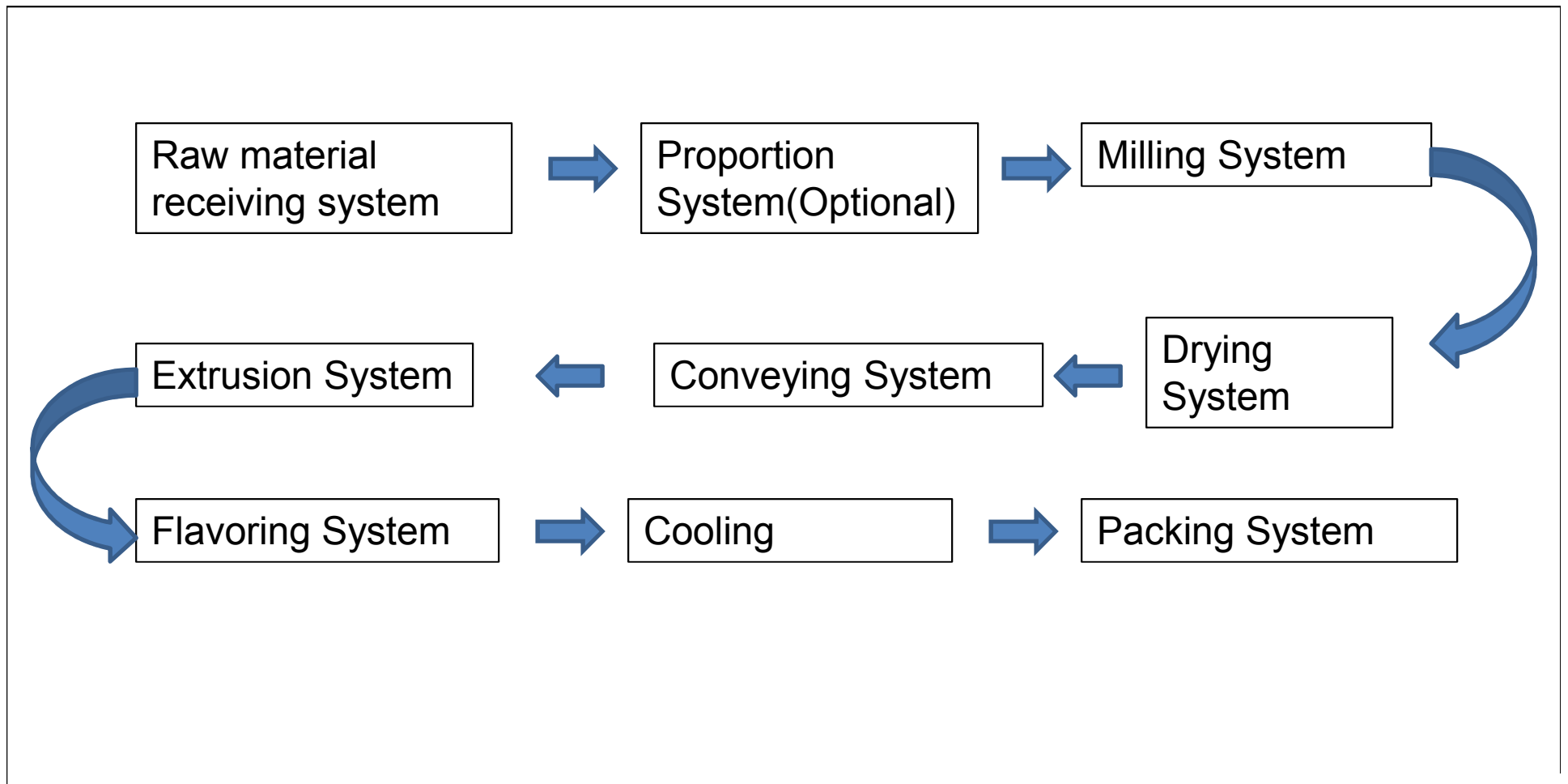


CORN PUFFS/KURKURE/CURLS

Machines are available in Indian market ranges from Rs 3-10 lakhs with capacity of 100-500 kg/hr



CORN PUFFS/KURKURE/CURLS- FLOW CHART



सत्यमेव जयते

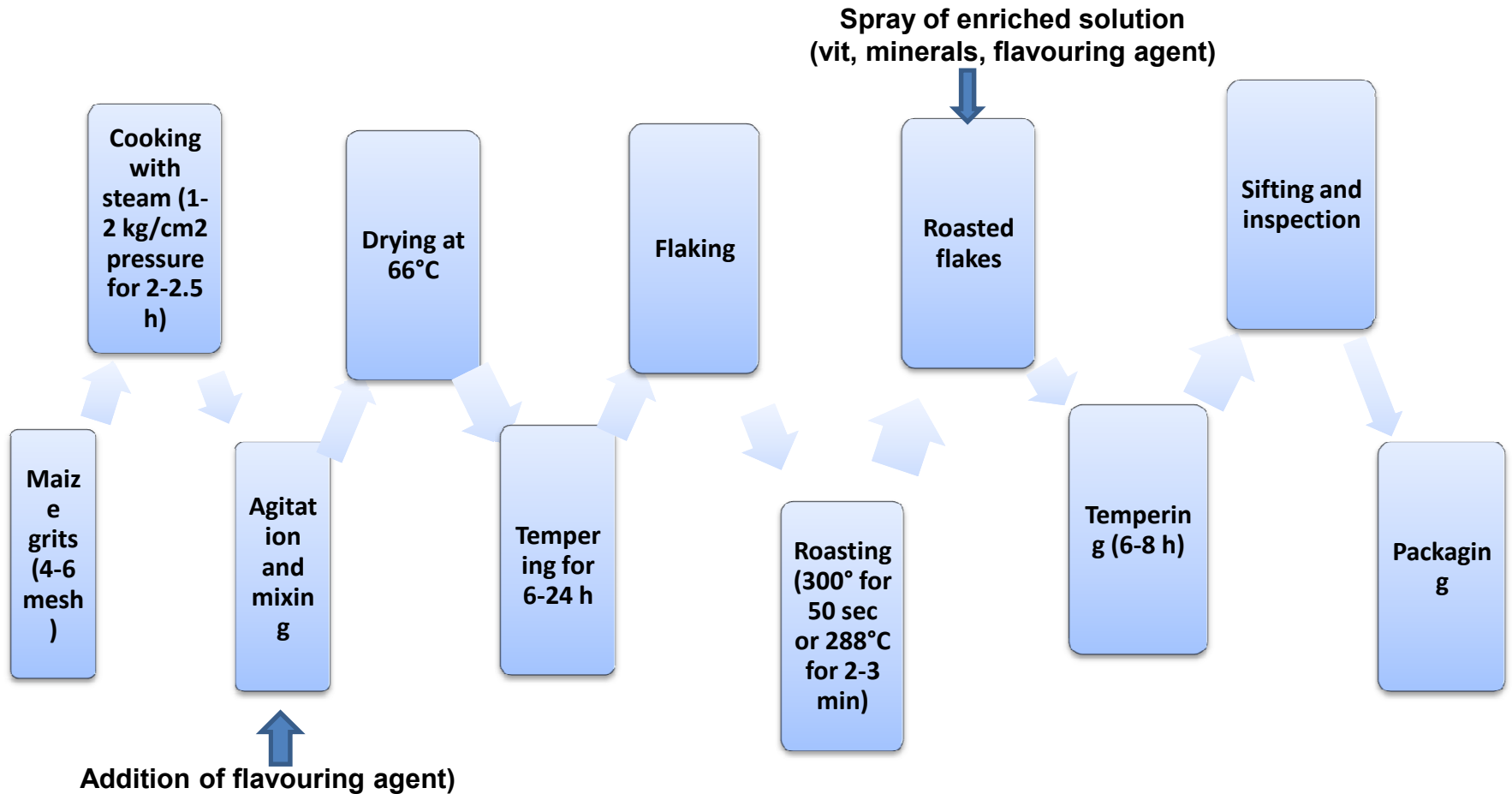


- Corn flakes, choco flakes, honey flakes, etc are being made in small-scale
- Makka Poha, used in snack industries like mixture namken
- Corn grits can also be produced through this machine, which is in high demand for export.
- India can become a big cornflakes exporter

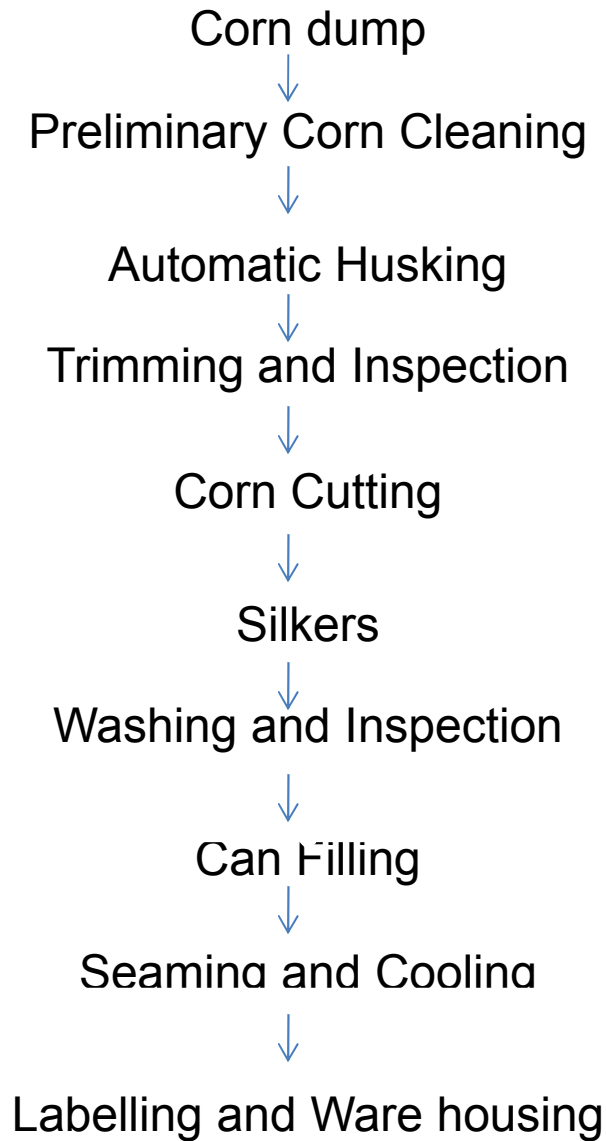




CORN FLAKES



CORN CANNING FLOW CHART



CANNING MACHINERY



Canning Machine



Can Filling Machine



BABY CORN

- Nutritional quality of BC at par with other major vegetables
- Richest sources of phosphorus
- Good source of fibrous protein
- Easily digestible
- Free from residual effects of pesticides
- It is like an organic food





BABY CORN - PRODUCTS

- ❖ Soups and various dishes
- ❖ Pickle, murraba, veg-recepies
- ❖ Baby corn pakora
- ❖ Canning & pakaging Industry
- ❖ Export potential



STABILIZED MINIMALLY PROCESSED BABY CORN

Methodology

Select mature baby corn cobs

Dehusk

Pretreat with 1.5% citric acid or
0.5% ascorbic acid

Air dry

Place in PP trays

Shrink wrap using 9 μ cryovac
film

Store under 10°C



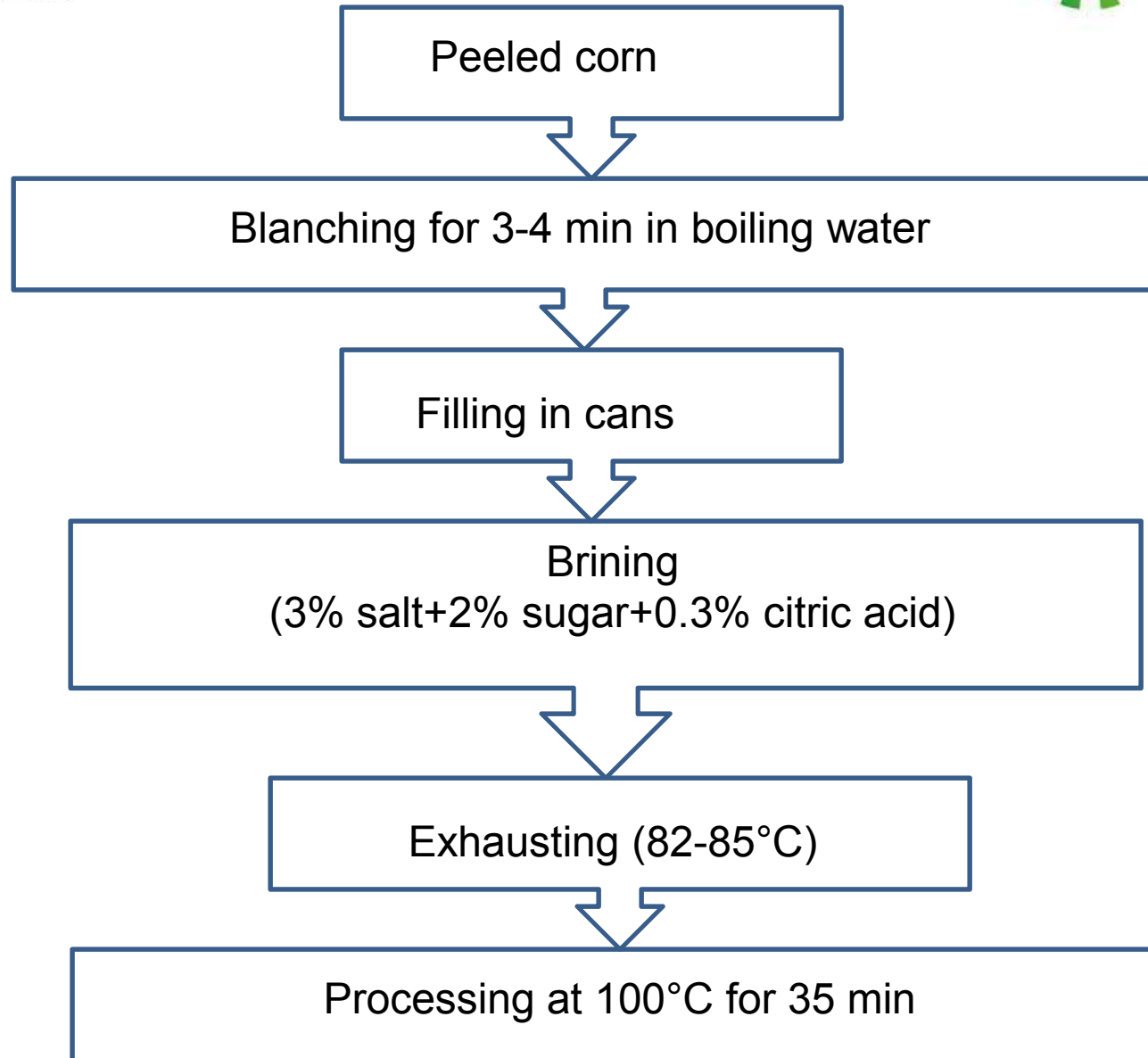
**Equipment/ Machinery
required**

- Shrink wrapping machine
- Soaking tank
- High speed fans

Storage life: 9 days

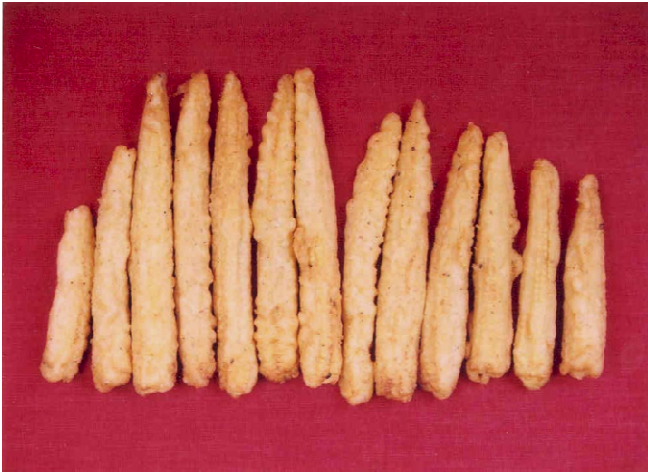


CANNED BABY CORN



VALUE ADDED BABY CORN PRODUCTS IN DAILY USE





Baby Corn Pakora



Baby Corn Chat



Baby Corn Cutlet



Baby Corn bufri



Baby Corn Halwa



VALUE ADDED PRODUCTS OF BABY CORN FOR COMMERCIAL AND EXPORT



Canned and pickle



Murraba



Chutney



Jam



Baby Corn Candy



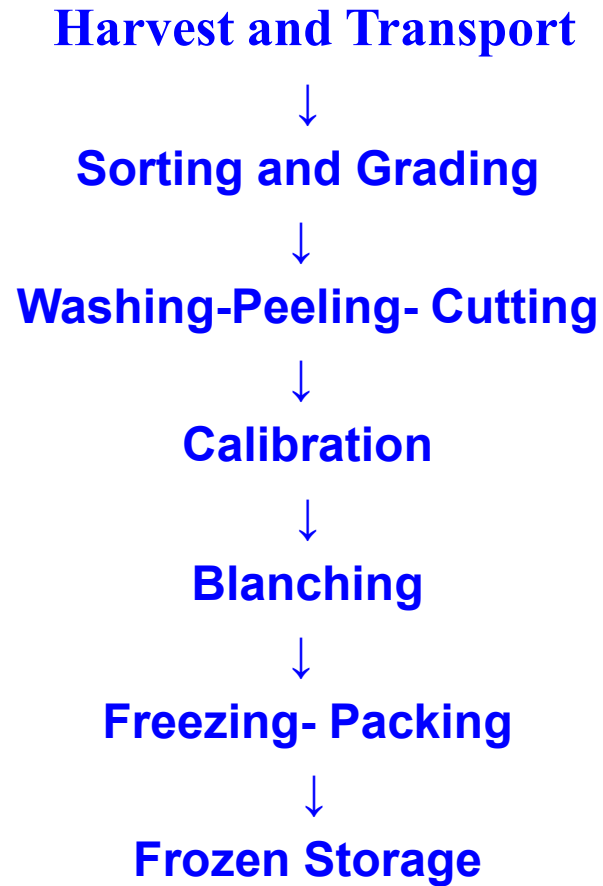
FROZEN AND DEHYDRATED BABY CORN FOR COMMERCIAL AND EXPORT

Frozen baby corn



Dehydrated baby corn

FROZEN CORN- FLOW CHART





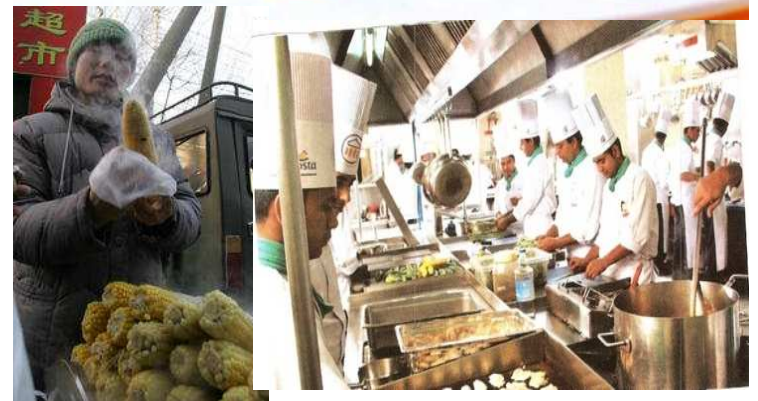
SWEET CORN FOR PERI –URBAN AGRICULTURE: PROMOTION OF SMALL SCALE INDUSTRIES

- Nutritious snack/fast food
- Anti-cancerous : Ferulic acid
- Low cost of production
- Internal and External Consumptions
- High Profitability
- Green fodder



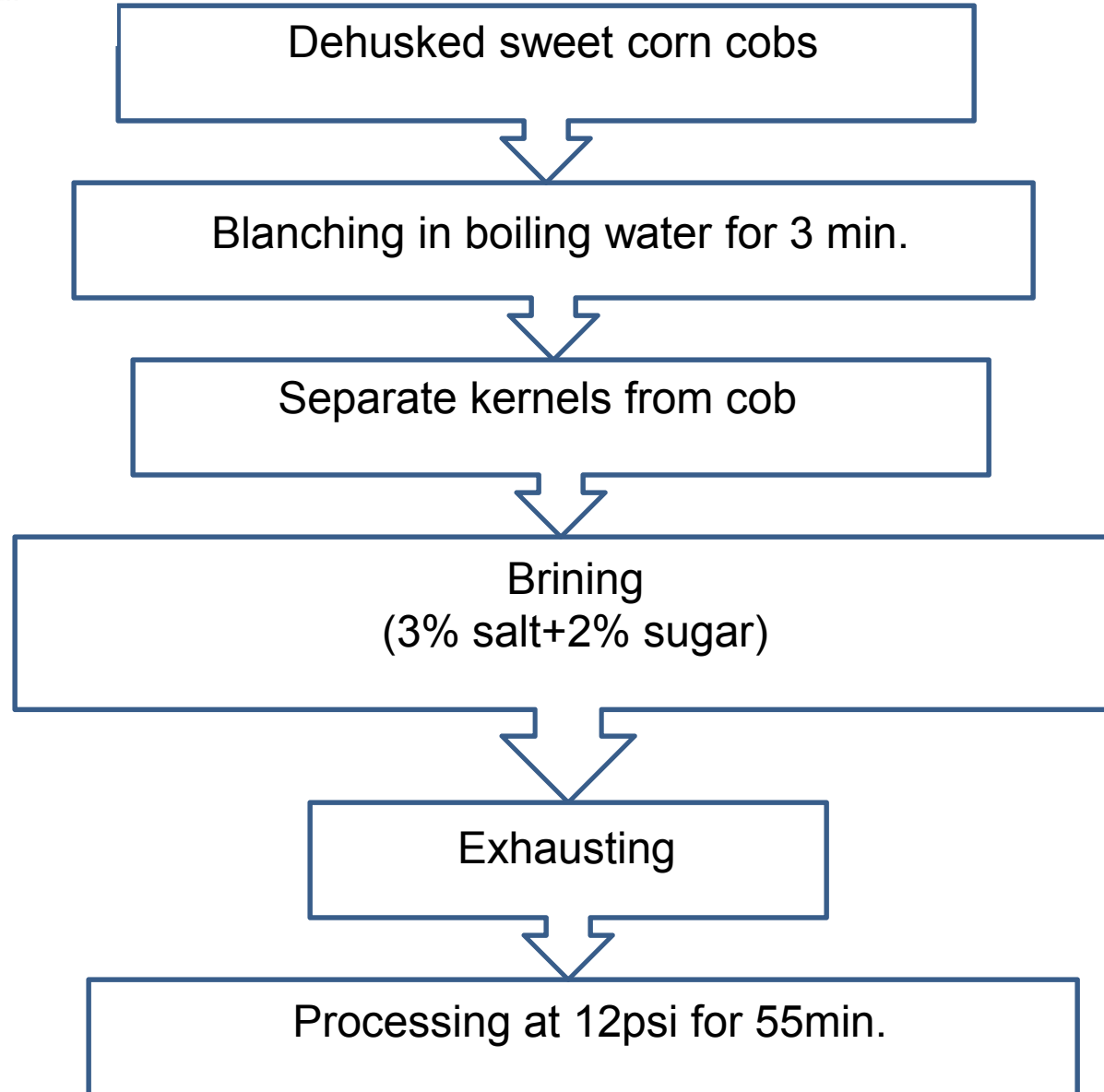
VALUE ADDED PRODUCTS OF SWEET CORN

- ❖ Condiments, soup, desserts, salads, snacks
- ❖ Canning industry
- ❖ Roasted green cob
- ❖ Export potential





CANNED SWEET CORN



NIXTAMALIZATION OR ALKALI TREATMENT PROCESS FOR MAIZE KERNEL TO INCREASE QUALITY AND SHELF LIFE OF CORN

Maize grain

↓ **Cleaning**

Soak maize grains in 1% lime water
(10 g of lime/litre water)

↓

Heat treatment at simmering temperature for 30 minutes

↓

Leave it for overnight

↓

Wash 3 – 4 times to remove lime

↓

Drying and bring down moisture level to 9-10%)

↓

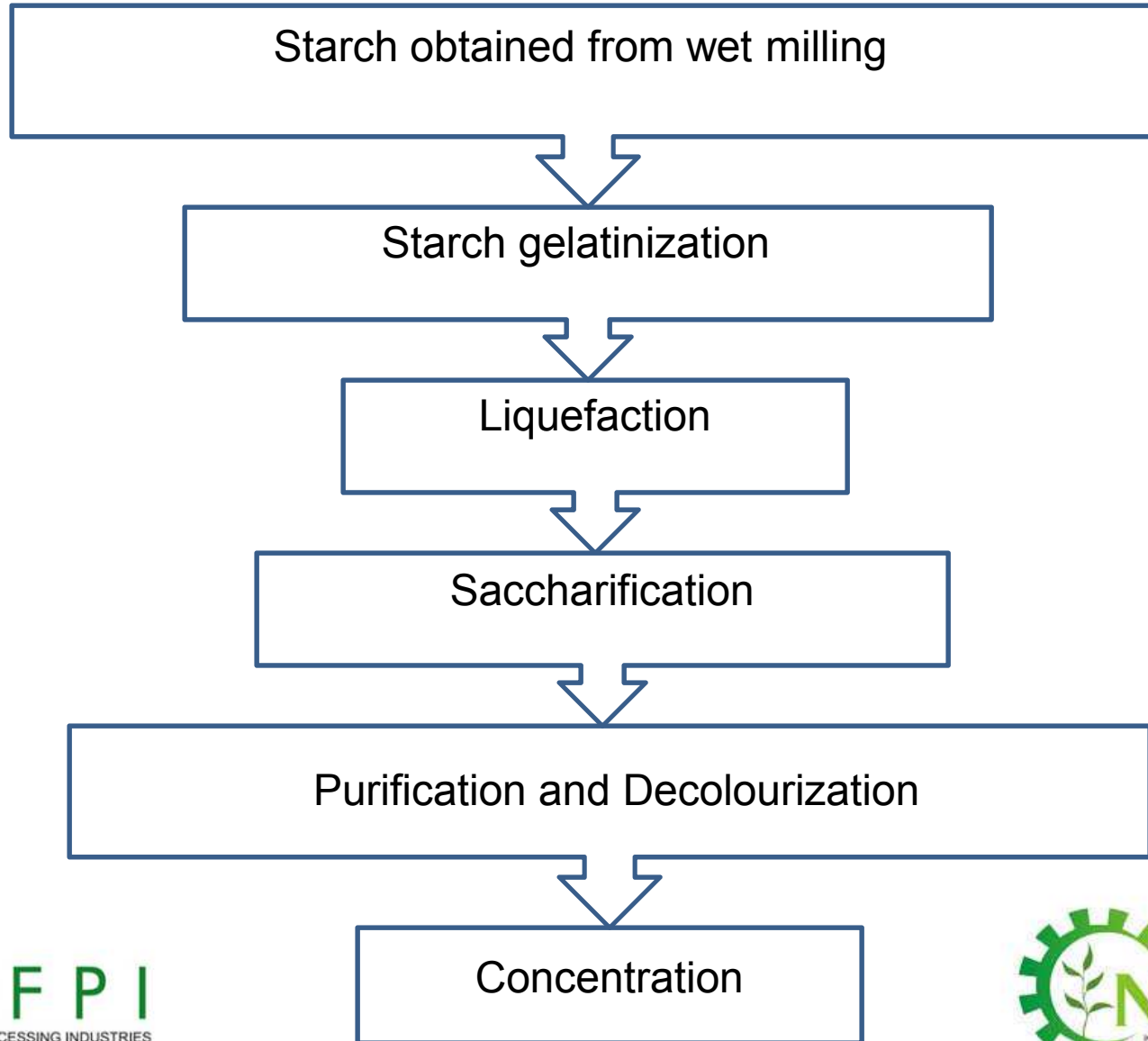
Store in air tight container



CORN SYRUPS

- The initial step for manufacture of corn syrup is to gelatinize the obtained starch under heat and pressure.
- The application of high temperature and pressure further helps to liquefy the starch by breakdown of glycosidic bonds.
- Addition of acids and enzymes further adds to the liquefaction process to yield a starch slurry.
- Enzymes maybe employed to obtain a mixture of short, medium and long chain saccharides in the slurry.

CORN SWEETENERS – FLOW CHART



सत्यमेव जयते



QUALITY PROTEIN MAIZE (QPM) MERITS OVER NORMAL MAIZE



- QPM products are nutritionally superior and healthy
- The products are with high biological value and digestibility
- Dietary diversification
- QPM green cob better than normal maize
- Export potential
- Products suits to all age group

TRADITIONAL PRODUCTS DEVELOPED FROM QPM



LADOO

(70 % QPM+30 % Soya bean)

QPM+bengalgramflour

- Crude protein-11.64-22.76 g/100g
- Crude fat-30.00-33.30 g/100g
- Energy-536.28-555.58 kcal.



POPPED LADOO

- Crude protein-10.83-13.45 g/100g
- Crude fat-4.71-5.89 g/100g
- Energy-392.33-413.33 kcal.



HALWA

- Crude protein-4.54-5.73 g/100g
- Crude fat-27.24-34.50 g/100g
- Energy-457.70-65.24 kcal.



BURFI

- Crude protein-7.96-15.67 g/100g
- Crude fat-24.53-33.45 g/100g



KHEER

- Crude protein-7.28-8.26 g/100g
- Crude fat-9.51-10.67g/100g
- Energy-430.25-442.95 kcal.



SATTU

(70 % QPM+30 % Soya bean)

- Crude protein-8.25-18.20 g/100g
- Iron-1.49-3.92 mg/100 g
- Energy-145-348 kcal.



CHEELA

- Crude protein-12.08-22.87 g/100g
- Crude fat- 10.37-14.19 g/100g
- In vitro protein digestability-55.99-73.82 g/100g



PURI(70 % QPM+30 % Bengal gram flour)

- Crude protein-10.60-12.88 g/100g
- Crude fat-42.06-3.62 g/100g
- Energy-1.23-2.00 kcal.



NAMAKPARA

(70 % QPM+30 % Soyabean)

- Crude protein-8.71-12.83 g/100g
- Crude fat- 17.51-24.93 g/100g
- In vitro protein digestability-68.43-72.57 g/100g



SEV

- Crude protein-19.58-23.22 g/100g
- Crude fat-19.58-23.22 g/100g
- Energy-490.54-507.62 kcal.

PAKORA

- Crude protein-11.53-14.74g/100g
- Crude fat-19.12-21.31 g/100g
- Energy-483.60-500.11 kcal.

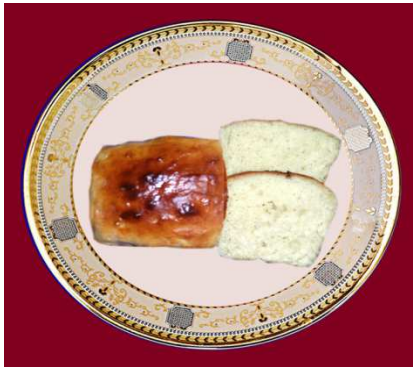
UPMA

(70 % QPM+30 % Soyabean)

- Crude protein-7.01-23.73 g/100g
- Crude fat-15.81-21.42 g/100g
- Iron-1.15-2.32mg/100g



BAKED PRODUCTS



BREAD

- Crude protein-10.83-13.45 g/100g
- Crude fat-4.71-5.89 g/100g
- Energy-392.33-413.33 kcal.



BISCUIT

(70 % QPM+30 % Soya bean)

- QPM
- Normalmaize
- Crude fat-4.71-5.89 g/100g
- Energy-392.33-413.33 kcal.



CAKE

(70 % QPM+30 % Soyabean)

- Crude protein-11.40-25.51 g/100g
- Crude fat-13.26-14.86 g/100g
- In vitro protein digestability-72.55-79.12 g/100g



PASTA

- Crude protein-8.49-9.80 g/100g
- Energy-415.11-420.57 kcal
- Calcium-35.59-38.54 mg/100g



VADI

(70 % QPM+30 % Soyabean)

- Crude protein-13.97-25.28 g/100g
- Crude fat- 3.09-14.06 g/100g
- Iron-3.85-4.51 mg/100g



VERMECELLI

- Crude protein-8.00-9.71 g/100g
- Crude fat- 4.03-5.77 g/100g
- Energy-415.54-427.41 kcal



INFANT'S FOODS



SWEET DALIA

(70 % QPM+30 % Soyabean)

- Crude protein-10.22-23.19 g/100g
- Crude fat- 3.29-12.25 g/100g
- In vitro protein digestability-76.92-81.96 g/100g

KHICHARI

- Crude protein-9.44-16.19 g/100g
- Crude fat- 13.13-20.20 g/100g
- In vitro protein digestability-72.02-79.29 g/100g



WEANING FOOD

- Crude protein-19.151-19.795g/100g
- Energy-571.46-584.36 kcal
- Calcium-364.13-364.49 mg/100g



SALTED DALIA

(70 % QPM+30 % Soya bean)

- Crude protein-9.83-11.04 g/100g
- Crude fat- 1.56-4.38 g/100g
- Calcium-26.65-28.09 mg/100g



CONVENIENCE PRODUCTS



DHOKLA mix

- Crude protein-12.26-15.15 g/100g
- Crude fat-6.53-9.48 g/100g
- Energy-403.35-426.72 kcal.



IDLI mix

- Crude protein-11.70-13.45 g/100g
- Crude fat-2.67-3.88 g/100g
- Energy-402.83-426.72 kcal.



COMMERCIAL PRODUCT

QPM CHAPATTI FOR FAST FOOD INDUSTRIAL GROWTH



- Nutri-cereal
- Mid day meal scheme
- Disaster management
- Army personnel in remote areas
- Fast food
- Dietary diversification
- Better shelf life than normal chapattis from different cereals

QPM CHIPS: HEALTH CAUTIOUS SNACKS INDUSTRIAL GROWTH



- Chips are common
- Liked by children

QPM chips: Merits

- 40% oil saving in fry
- Nutritionally superior
- Non-sticky and crispy
- Easily digestible
- For all group: Old, young and children



BAKERY FROM QPM: A QUALITY SNACK

- ❖ Presently most of bakery products are from wheat
- ❖ If switched to QPM the products will address human health due to...
 - High fibrous and Crispy
 - Non-sticky
 - High biological value
 - Easily digestibility
 - Nutritious
 - Less cholesterol content
 - Suits to the patients and children





QPM PORRIDGE (DALIYA): HEALTHY FOOD



- Low cost nutritiously superior natural lysine rich food
- Suits in mid-day meal
- Easily digestible
- Prepared like Upma: good breakfast healthy food
- Mixed with milk as kheer
- Sweet recipes like wheat daliya
- For all: Pregnant ladies, weaning food, Old

NUTRITIVE SNACKS INDUSTRY

- ❖ Roasted dried maize cobs
- ❖ Roasted Sweet corn cobs
- ❖ Babycorn pakora
- ❖ Popcorn
- ❖ QPM biscuits, Kurkure, chips, pasta, mathi, chakli, etc.
- ❖ Corn flakes





Corn Dehusker



Maize Sheller



MACHINERIES



Maize Husker Sheller



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