

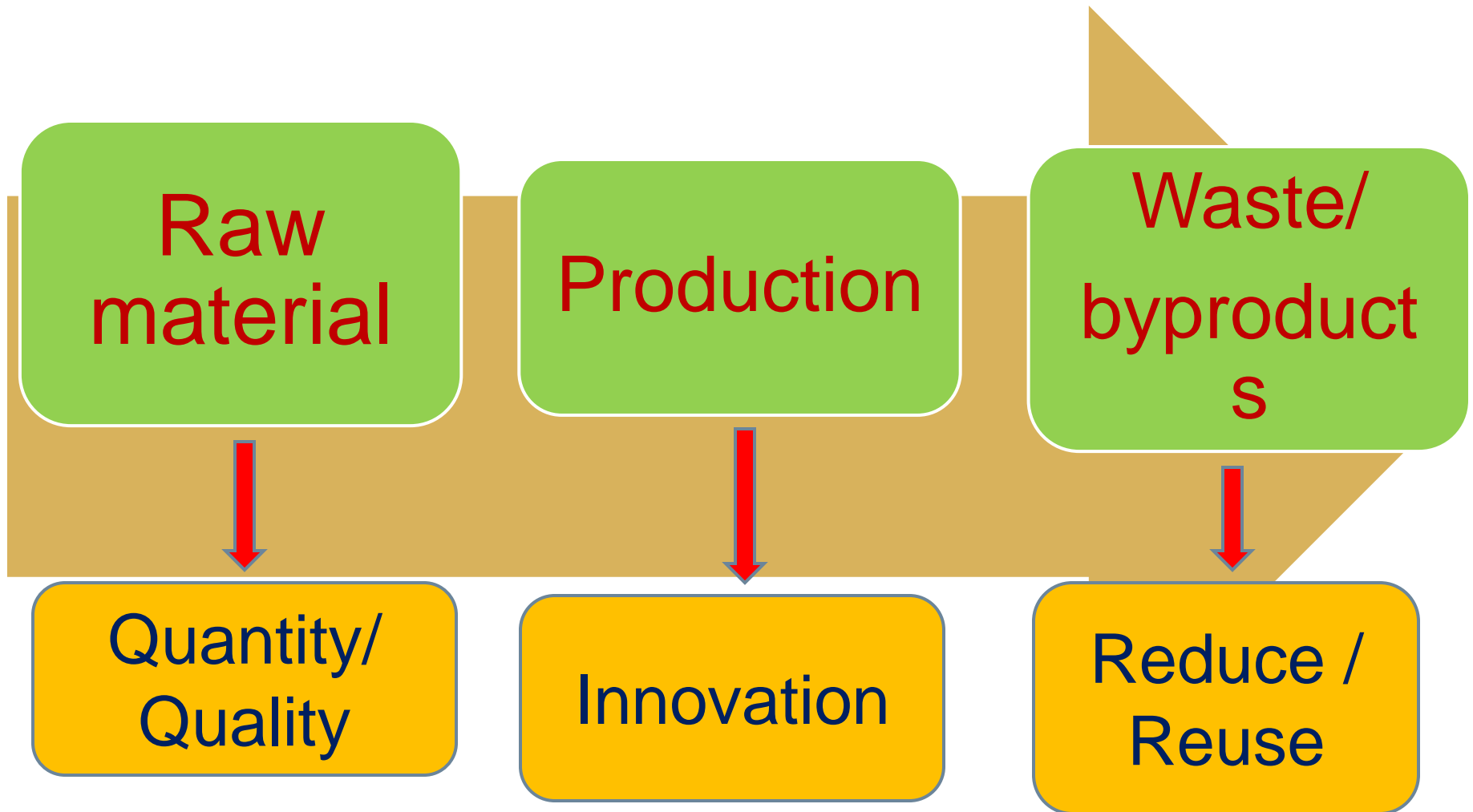
GENERAL INTRODUCTION TO SUSTAINABILITY ISSUES IN THE FOOD SECTOR

Dr. MALATHY V.
Food Technologist,
PFNDAI

SUSTAINABILITY - Definition

The practice of maintaining processes of production indefinitely without degrading or endangering natural bio-systems so it meets the needs of present without compromising the ability of future generations to meet their own needs

Sustainability in food processing



Opportunities for innovative technology in food processing

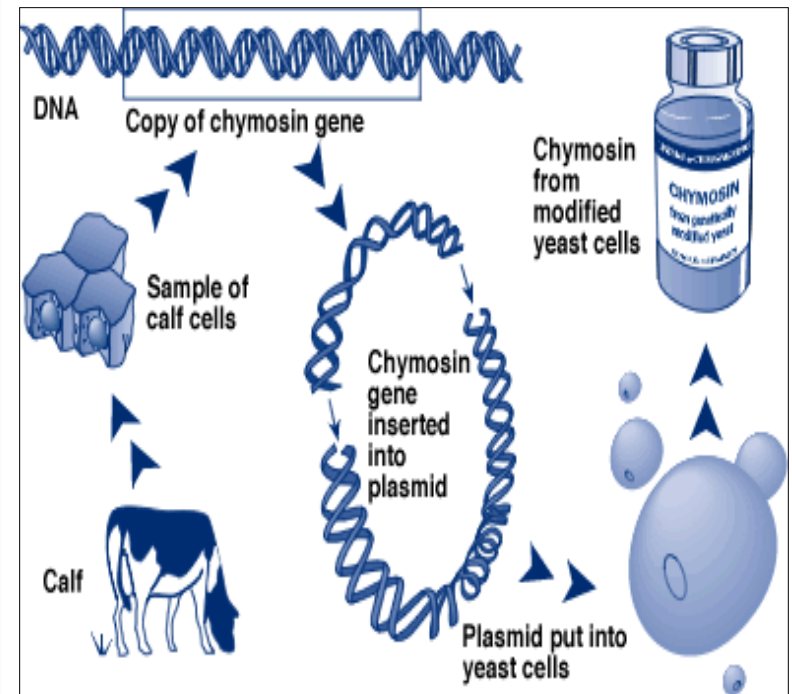
- ❖ Resources: scarcity and increasing prices for biomaterials, energy , water
- ❖ Society: India is an unusual food and beverage market
- ❖ Market/consumers: trust, price competition
- ❖ Technology: novel solutions that facilitate novel practices

Innovative technologies: Examples

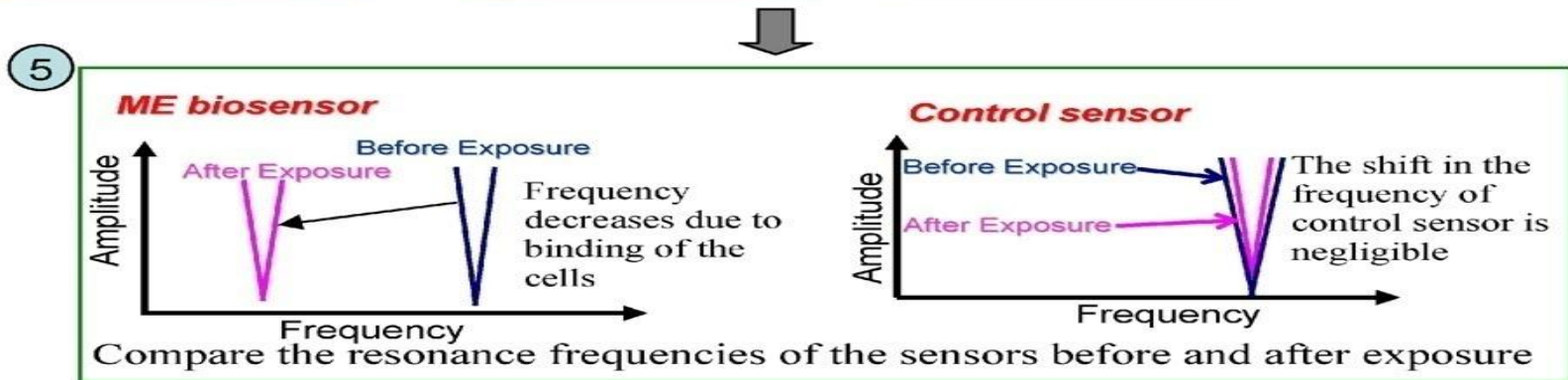
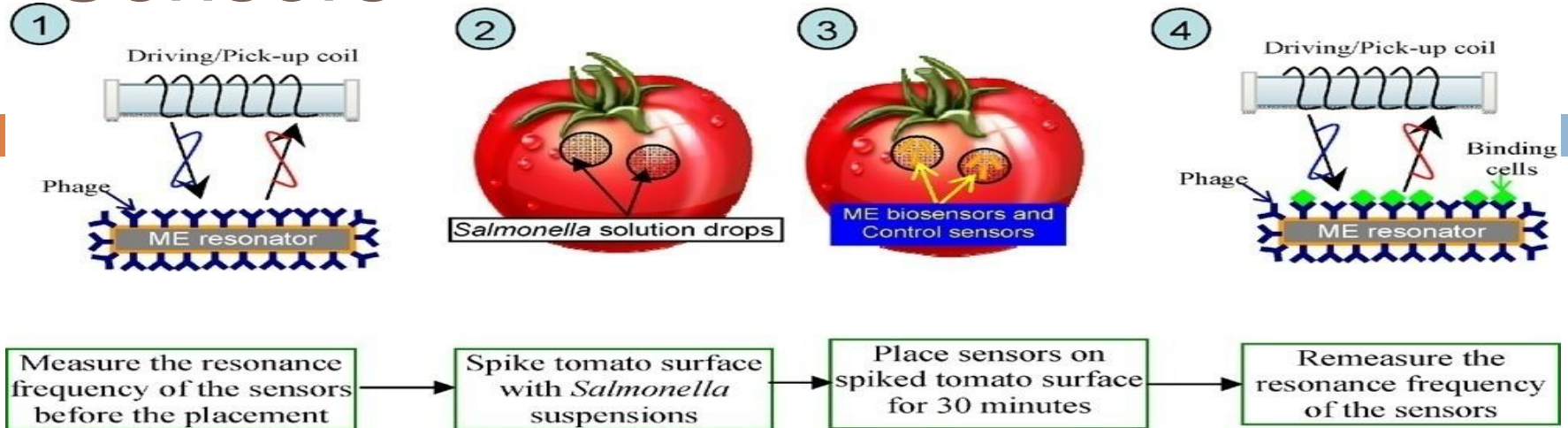
- **CHEESE RENNET**
- **SENSORS**
- **PACKAGING**
- **NANO/MICROTECHNOLOGY**

DAIRY INDUSTRY: RENNET

Animal	Calf	Chymosin (88-94%) Bovine pepsin (6-12%)
Plant	Dried flowers <i>Cynara cardunculus</i>	Plant proteases
Microbial	Fungal species e.g. <i>Rhizomucor miehei</i> ,	Microbial proteases
Fermentation Produced Chymosin	Fungus (bovine chymosin gene cloned into fungus.)	Chymosin (100%)



Sensors



Main applications of sensor technologies in food processing are

- quality control
- process control

Both types of applications contribute to improving the sustainability of food production

Sustainable packaging



Biodegradable film vacuum skin



Biodegradable film vacuum skin



Cardboard based barrier trays



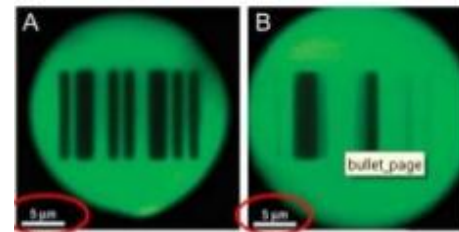
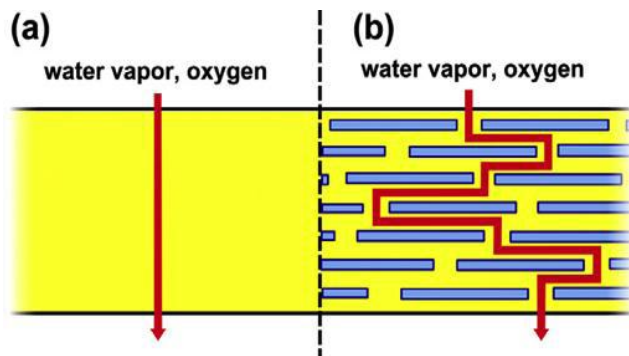
Paper bottle



Thin packaging

Nano - and micro technology

- The use of nano- and micromaterials in food packaging, e.g., microclay to enhance barrier properties or nanosilver particles to inhibit the growth of micro-organisms



Nano bar code for tracking of material

Improved Performance of Packaging Materials

Longer Shelf-life and Better Food Quality

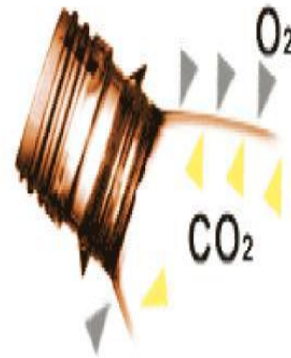
Increased Sustainability: Using Less Resources
and Producing Less Waste

NANO COATED BOTTLES

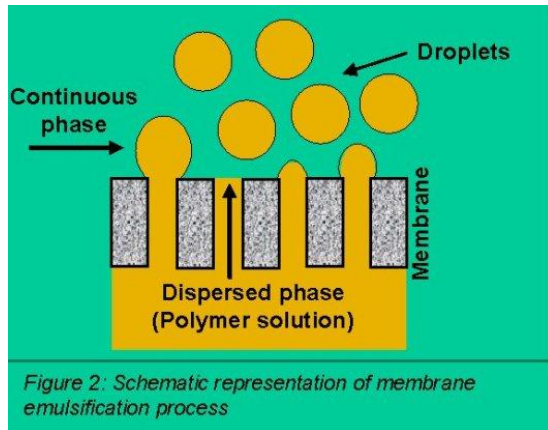
The Environmental Potential

In manufacture, transport & recycling, nano-coated PET bottles generate:

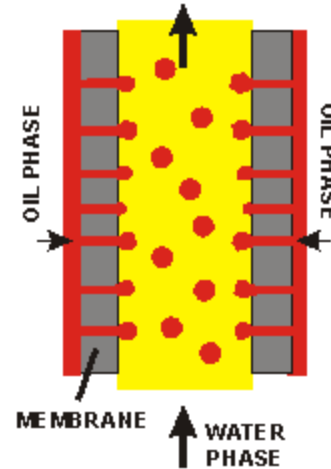
- 33% fewer greenhouse gases than aluminium cans
- 60% fewer than disposable glass bottles



MICROTECHNOLOGY



membrane emulsification



Applications:
Oil in water emulsion
Emulsion in emulsion
Microspheres
Microcapsules

Advantages of this process:

Low energy consumption,
Control of droplet size and droplet size distribution
Low shear stresses

Food processing waste



Innovative processes for utilization of waste and by-products

1. Generating valuable materials from the by-products and
 2. Using technologies for reduction in waste production can contribute to sustainable food processes.
- **Some examples are:**
 - production of potato protein from potato processing waste water,
 - production of vegetable or fruit juices from cutting residues,
 - Whey permeate is a success story

Grape processing



Pomace Processing – “Grape Seed Separation”

- **Pomace separation after Crushing for wine**
- **Grape Seeds Separation & Drying**
- **Grape Seed Oil Pressing – Cold Press – Extra Virgin Oils**

Dried Pomace after seed separation

Powdered food colour

No Wastes for Disposal



By-products in rice milling industry

- ❖ **Rice Broken** (20%) – used as ingredient in other products e.g idli mix, puttu mix
- ❖ **Bran** (av 5%) – oil edible and industrial grade
 - ❖ Wax (2-4%)
 - ❖ animal feed
- ❖ **Husk** (22%) - fuel, silicon tetrachloride, husk board
- ❖ **Straw** – feed, fuel, silica
- ❖ **Ash** - Carrier for biofertilizer organisms, Sodium silicate, Activated carbon




Use of waxes

Chewing gums
Coating over fruits
For food wraps
Carbon paper and
Polishing of floor and
leather etc.
Can replace the
usage of Carneuba
wax (imported)

Alternative processes requiring less energy or water

- Using residual heat or transfer from one area to another
- Process alterations : combining/integrating energy intensive processes to more efficient results
- Reduction of water requirement can be attained through dry fractionation (replacing wet fractionation)
- **Membrane technologies for reuse of water**



It is not the strongest species that survive, nor
the most intelligent, but the ones who are most
responsive to change

-Charles Darwin-

THANK YOU