



Plant-based Proteins: Health Advantages & Changes Needed to Incorporate in Today's Diet

Dr. Shashank Bhalkar

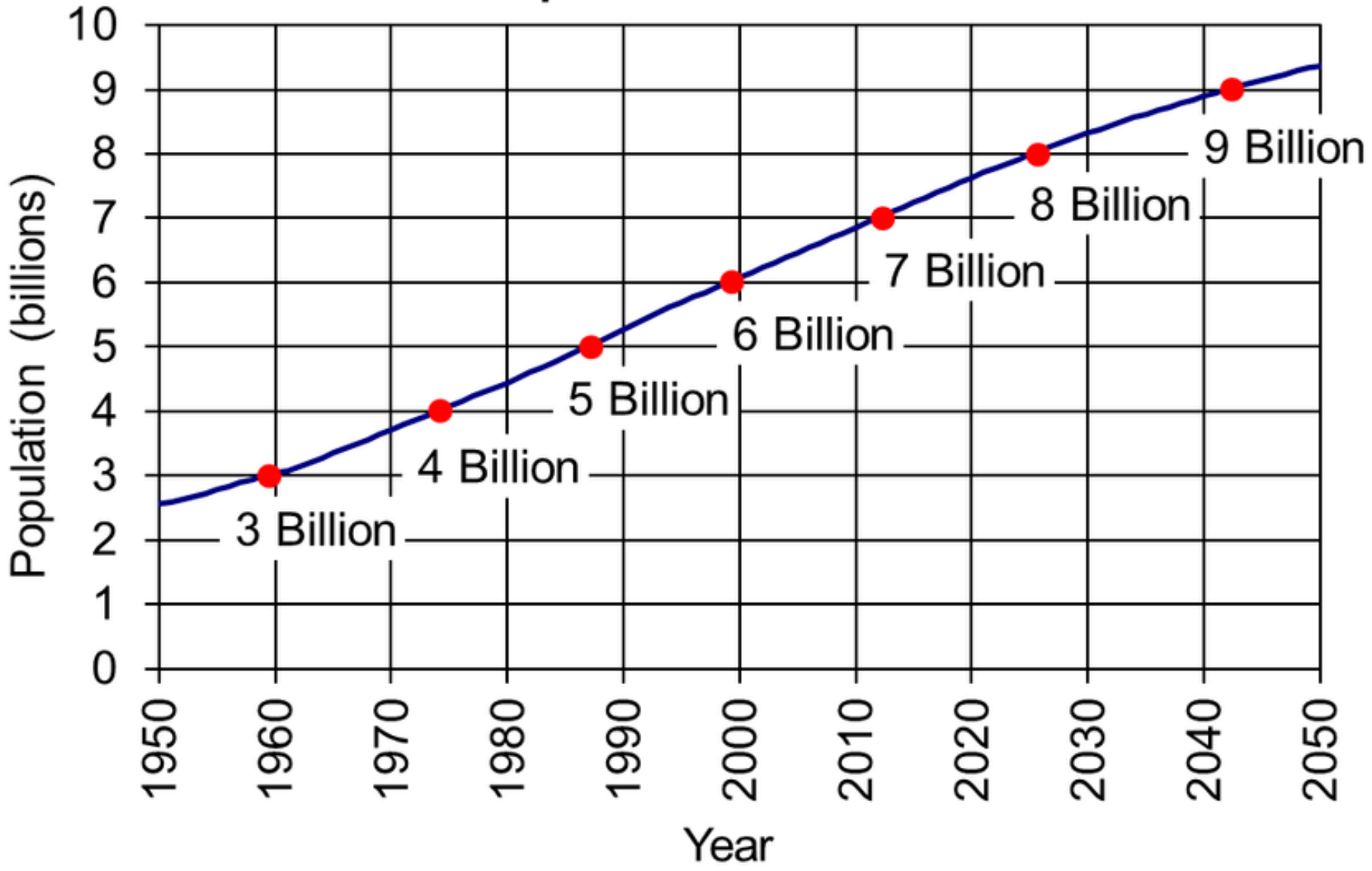
Executive Director,

Protein foods and Nutrition Development Association of India

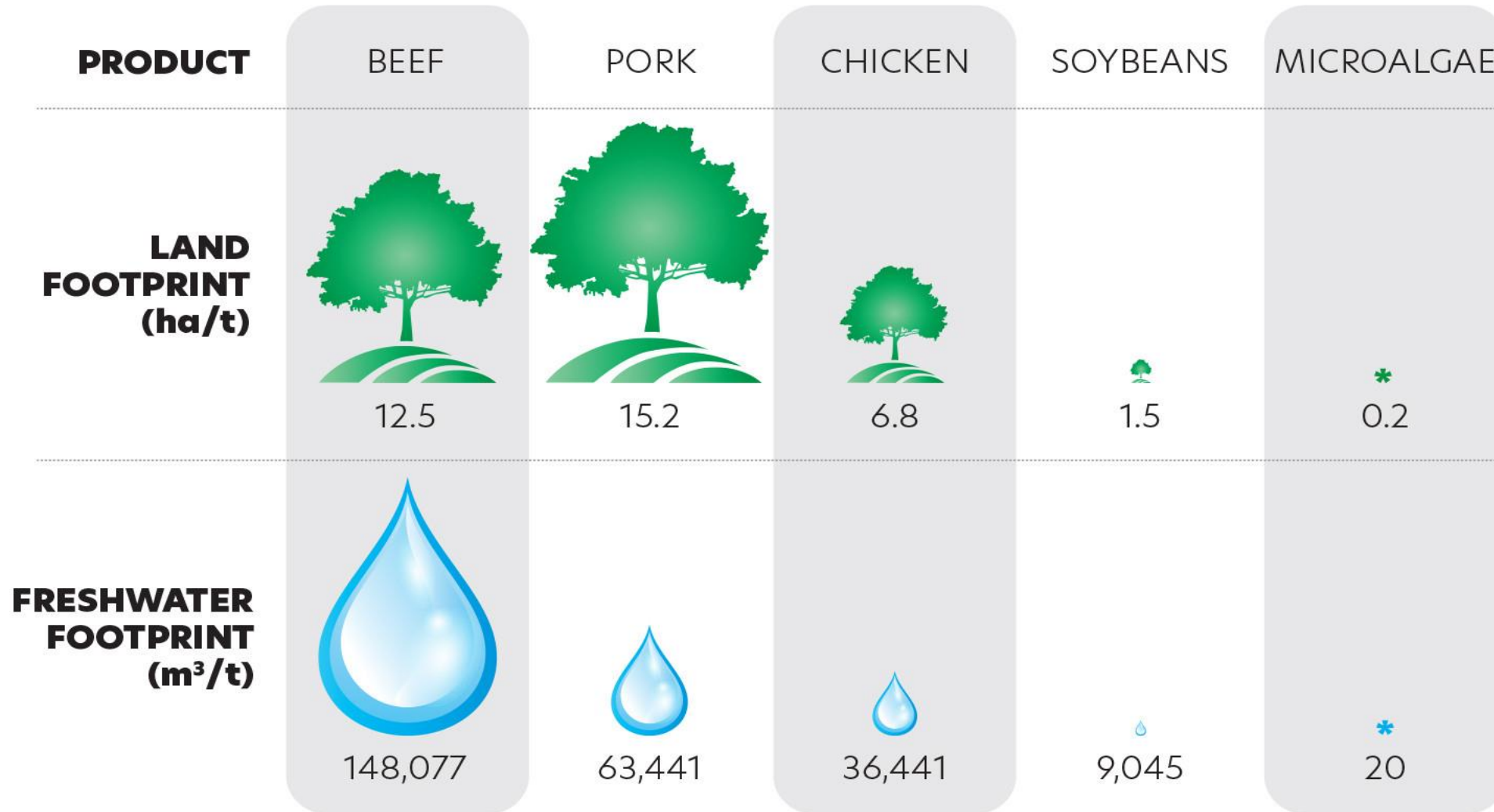
Implications of rise in World population

- The global population today is between 7 to 8 billion.
- It will be 9.6 billion by 2050
- India and China alone will be major contributors
- Requirement of more food, housing, infrastructure, healthcare, Jobs
- Increased need of food and therefore Proteins
- Urbanisation, increased incomes, growing elderly population.
- Will require more land, and energy, increase in GHG.

World Population: 1950-2050



Land, water requirement of different sources of Proteins



Protein Requirements for Indians

- ICMR Recommends 1g protein/kg body wt
- Indian Male RDA 54 g/day
- Indian Female RDA 45.7 g/day



Protein Intake by Indians

- **IMRB Survey 2015**
- **More than 80% Indians are protein deficient**
- **91% vegetarians are deficient**
- **85% non-vegetarians are deficient**
- **Indians consume more of carbs & fats than required**
- **Almost 60% proteins are consumed through grains**



ANIMAL PROTEINS	PLANT PROTEINS
PDCAAS is 1.00 or very close to 1.00	Typically, PDCAAS values are below 1.00
Generally contain all the essential amino acids with some exceptions like gelatin.	<p>Can have insufficient amounts of one or more essential amino acids.</p> <p>Various plant sources differ in the limiting amino acid</p> <p>For example the limiting amino acids in Quinoa are Isoleucine, Leucine, Lysine, Threonine, Valine, in red kidney beans are sulphur-containing amino acids (Cysteine and methionine), in rice and oats the limiting amino acids are lysine and threonine</p>
Absorption- about 90%	Absorption- approximately 60-70%
Digestibility – very high ~85% or more	<p>Digestibility less than that of animal proteins</p> <p>However, purified plant proteins have good digestibility (80-90%)</p>

Disadvantages of Animal proteins

- Heart diseases due to saturated fat content in red meat
 - Type 2 diabetes due to saturated fat consumption (Increased insulin resistance)
 - Strokes (Atherosclerosis)
 - Development of certain types of cancer due to saturated fats in red meat
 - Ethical consideration as it involves sacrificing animals
- Poultry (lean meat) and fish (contains omega 3 fatty acids) are exceptions to these disadvantages

Needs for Plant-based Proteins

- Health Benefits compared to animal foods
- Sustainability
- Effect on Global Environment

Plant-based Protein Foods: Health advantages

- Plant protein foods, lower in saturated fat and cholesterol-free, hence lower risk of non-communicable diseases like heart attack, cancer.
- High in fibre, vitamins & minerals
- Beneficial for chronic kidney disease patient as they are not as damaging to the kidneys as animal protein.
- Plants contain phytonutrients like soy isoflavones and carotenoids which are beneficial to health
- Useful in weight-management
- Longevity and mortality reduction can be attained by consuming plant proteins

Plant-based Protein Foods: Other advantages

- Combinations can improve quality and bioavailability
- Newer sources like algae and sources such as soy are of high quality and have health benefits
- Relatively less expensive
- Lower emission of greenhouse gases thereby it is sustainable

Challenges of Plant-based Proteins

- Most are of lower quality so combinations needed to elevate quality
- Absorption of Nutrients affected due to anti-nutritional factors .
Digestibility of isolates is higher.
- Some nutrients provided by animal foods e.g. vitamin B12 etc. need to be supplemented
- Taste, flavour & mouthfeel needs to be improved when making analogues so consumers will accept them. This requires addition of several additives
- Currently cost is very high compared to animal proteins especially for analogues

Plant-based Proteins: Associated health issues

- Certain antinutrients in plants (e.g., lectins and some saponins), can cause adverse effects- e.g. leaky gut and autoimmune effects
- Protein maldigestion can occur due to trypsin and protease inhibitors
- Carbohydrate maldigestion can happen due to alpha-amylase inhibitors
- Mineral malabsorption can happen due to phytates, tannins, and oxalates
- Behavioural effects due to conversion of cereal gliadins to exorphins.

- **Protein Percentage in Animal Foods -**

ANIMAL FOODS	DAIRY
Mutton 18 – 20%	Milk Buffalo 3.7%
Chicken 18 – 22%	Milk Cow 3.2%
Fish - Betki 15%, Hilsa 22%, Bombay duck 14%, Mackerel 22%, Pomfret 19%, Sardin 18%, Tuna 25%	Paneer 18%
Egg Whole 13% (white 10%, yolk 15%)	Khoa 16%
	Cheese 25%

• **Protein Percentage in Plant Foods -**

CEREALS & MILLETS	PULSES & OIL SEEDS	TREE NUTS
Amaranth (Rajgira) seeds 13 – 15%	Chickpea (chana) whole: 19%, dal: 22%	Almond 18%
Bajra (Pearl Millet) 11%	Lentil whole: 23%, dal: 24%	Cashew 19%
Jowar (Sorghum) 10%	Beans: 20%	Pistachio 23%
Corn dry 9%	Kidney Beans Rajmah 20%	Walnut 15%
Corn tender 4%	Peas (dry) 20%, green 7%	
Rice milled 8%	Soybean 36 -38%	
Rice brown 9%		
Wheat 11%		

Newer Sources of Plant Proteins

- Spirulina 50%
- Chia seeds 15-24%
- Quinoa 12%
- Hemp seeds 25%
- Rice bran protein 12%



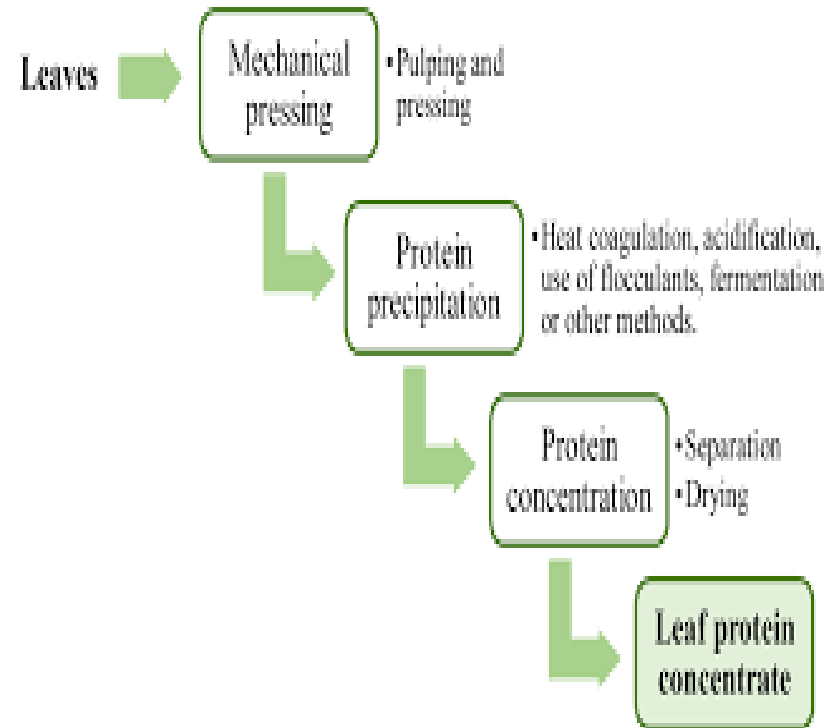
Algae as Protein

- Seaweeds and Microalgae
- Nutritious and sustainable
- Poor digestibility because of anti-nutritional factors
- Conventional methods of extraction: Acid alkali
- Novel processing methods like ultrasound, microwave, or pulsed electric field-assisted extraction can also help improve digestibility



Leaf protein concentrate

- Moringa leaves
- About 40% proteins
- Lot of work in eighties
- Commercialisation is challenge

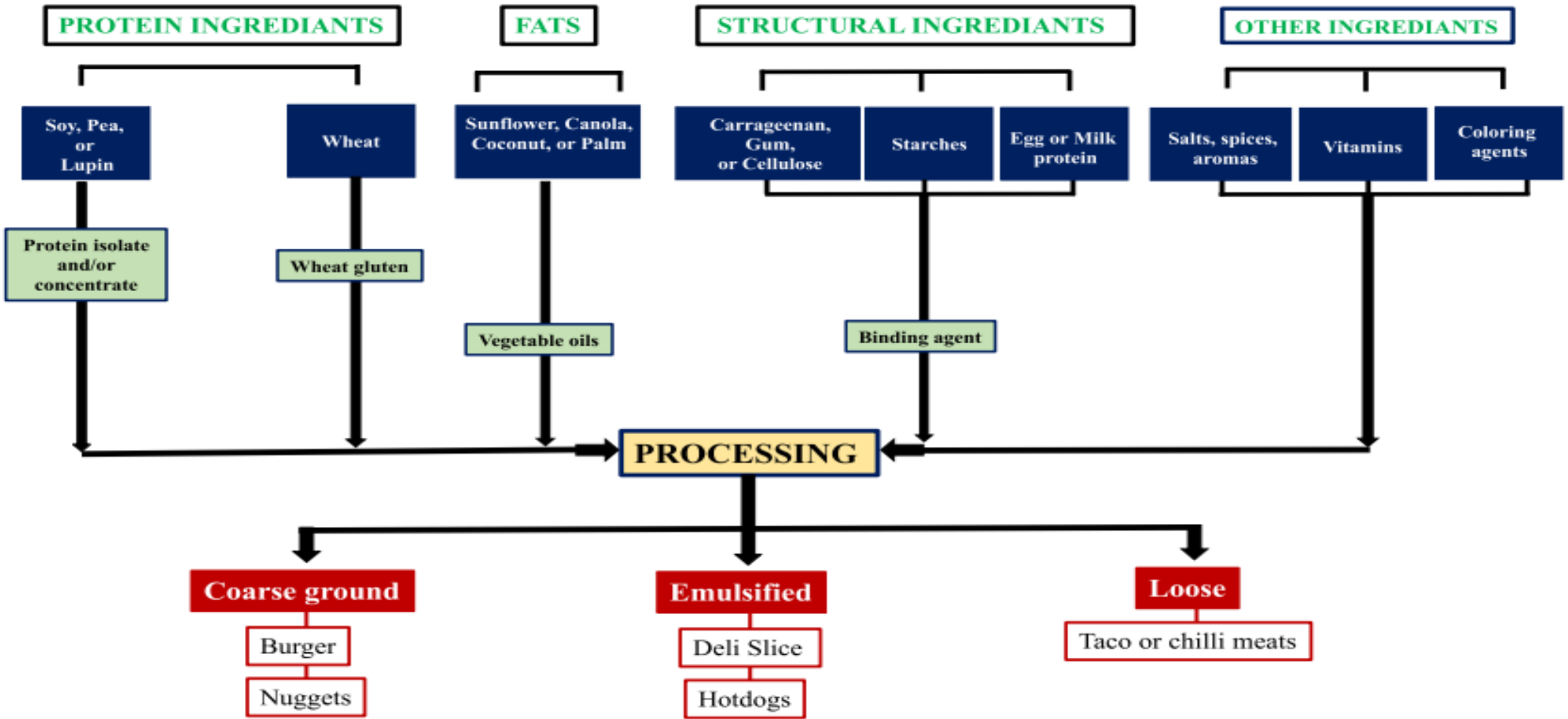


Millets: Potential plant protein source

- International Year of Millets
- Miracle crops : Grow in low water, high temp., no fertilisers
- Sorghum (Jowar), Pearl Millet (Bajra), Finger Millet (Ragi)
- 7-12% proteins, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fibre
- Nutricereals: Non allergenic, phytochemicals giving antioxidant, rich in micronutrients like vitamins and minerals.
- Issues and problems: Increase consumption, awareness, product development, market



Meat substitute Manufacturing



Challenges

- Meat texture, tenderness, flavor, mouthfeel because of Fat.
- Incorporation of fat in Plant based formulation is challenging.
- Stabilization of plant oils which are prone to oxidation
- Off flavor and aroma of plant proteins



Commercial considerations

- Most of the proteins are allergenic to some population. Therefore Allergen warning on label is required on manufactured products
- Ice cream with dairy fat replaced to be called as Frozen Dessert
- When margarine was first introduced butter manufacturers protested
- Issue on plant based milk from Dairy industry
- Similar issues with plant based meat are expected

Plant based protein-rich snack foods

- The best way to increase consumption is through snacks.
- Global upsurge in health awareness, sports persons, lifestyle
- Some examples of protein-rich snacks: Tofu rolls, Chickpea puffs, Chia seed pudding, Protein Khakra, Granola bars, Sprout salad, Protein Cookies, Protein flakes, Protein drinks, Chilla mix, Nuggets
- Now many Millets based snacks are available. Millet puffs, Millet namkeen, Millet masala, Cookies
- Global protein snacks market growing CAGR 9.8% in 2024 – 33.
- Market size in 2023 is USD 4.8 B will grow to USD 11.1 B in 2033.

#SolveWithProtein

A call to businesses and industry leaders to address the protein demand by providing protein-rich foods that help build a healthy and nutritionally secure population nationwide.

Thank
you

The text "Thank you" is written in a black, cursive-style font. The word "Thank" is on the top line and "you" is on the bottom line. The letters are decorated with thin, horizontal lines. Several small, green, stylized leaves are scattered around the text, primarily on the left and right sides, giving it a natural, organic feel.