

# Opportunities to address nutrition needs in South Africa

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## Nutrition basics

An adequate, healthy diet must satisfy human needs for **energy** and **all essential nutrients** in a **culturally acceptable** way.



# South Africa

- Middle income country
  - Population of 52 million people, 11 languages
  - Food secure at national level
  - Majority of SA households live in poverty with limited food variety (mainly staples) available in the home
- White maize porridge, brown bread, sugar, milk & tea (NFCS, 1999)
- Rapid urbanization and acculturation



# Anthropometric status of South Africans

Rising obesity in the midst of severe nutritional deficiencies

- 30.9 % preschool children stunted
- 1 in 3 children overweight
- ~ 60% of adults are overweight or obese

(Demographic and Health Survey, 2003)

Double burden of disease often evident within same households, and often even within the same individual



# Nutrient Status of South Africans

One out of two children (50%) suffer from malnutrition, with an intake less than half the recommended level for many nutrients:

- Energy, vitamins A and C, riboflavin, niacin, vitamin B6, folate, iron, zinc and calcium
- 2 out of 3 of children & 1 out of 4 women suffer from **vitamin A deficiency**
- 1 out of 5 women & 1 out of 7 children suffer from **iron deficiency**
- Nearly half of all children in SA suffer from **zinc deficiency**

	Risk Factor	% of all deaths
1	HIV/AIDS	26.3
2	High blood pressure	9.0
3	Tobacco smoking	8.5
4	Alcohol harm	7.1
5	High BMI (Excess weight)	7.0
6	Interpersonal violence	6.7
7	High cholesterol	4.6
8	Diabetes	4.3
9	Physical inactivity	3.3
10	Low fruit and veggie intake	3.2

**8 risk factors related to diet**

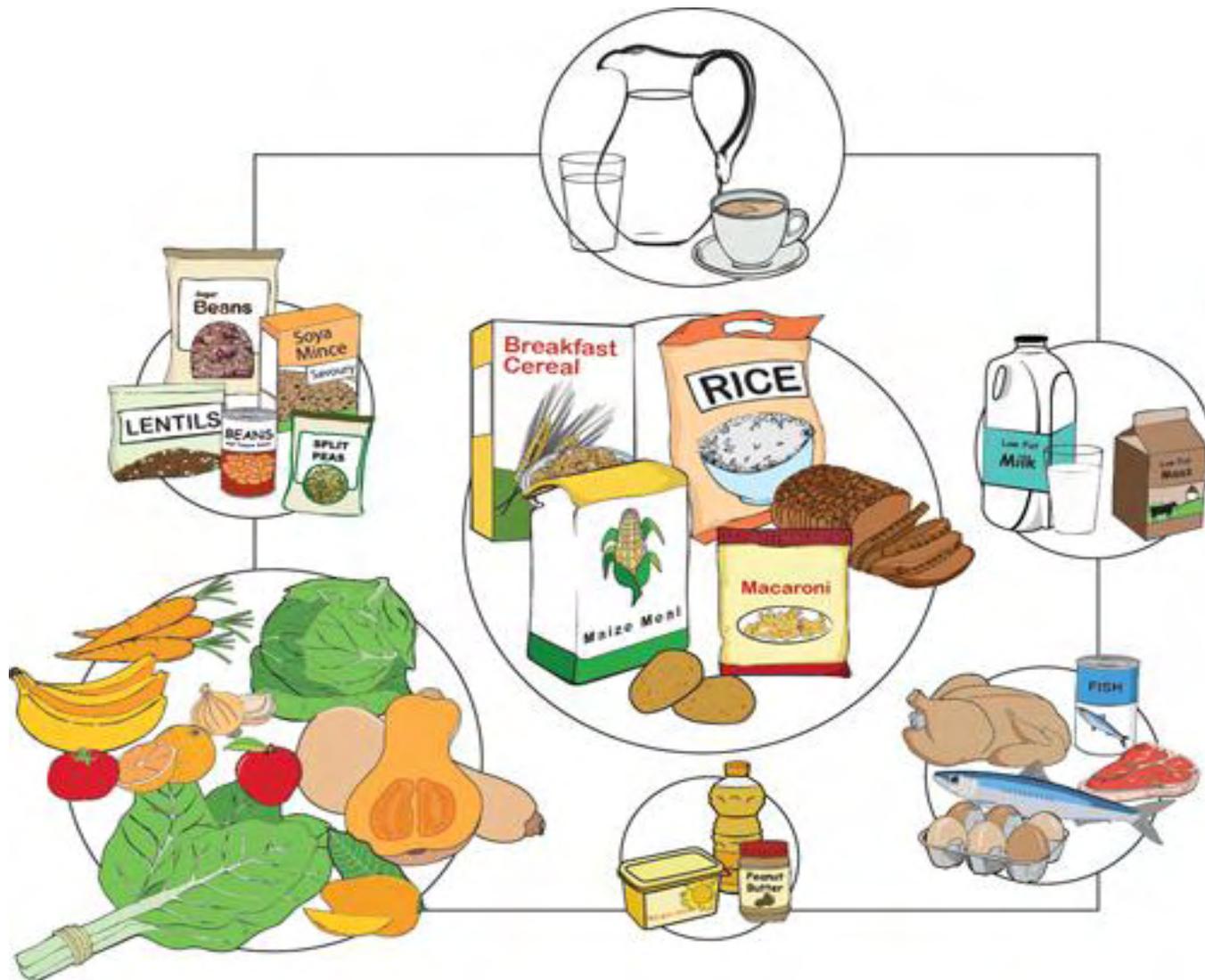
**6 risk factors related to obesity**

**Norman et al., 2007  
SAMJ 97:7**

# Revised Food-Based Dietary Guidelines (2012)

1. Make starchy food part of most meals
2. Fish, chicken, lean meat or eggs could be eaten daily
3. Have milk, maas or yoghurt every day
4. Eat plenty of vegetables and fruit every day
5. **Eat dry beans, split-peas, lentils and soya regularly**
6. Use salt and foods high in salt sparingly
7. Use fats sparingly; choose vegetable oils rather than hard fats
8. Use sugar and food and drinks high in sugar sparingly
9. Drink lots of clean, safe water
10. Be Active!

# South African Daily Food Guide (2012)



# 5. Eat dry beans, split-peas, lentils and soya regularly

## Actual consumption?

### In low income countries:

- 6% of total dietary energy is derived from from pulses, nuts & oilseeds
- 3% from meat and offal
- 11% from roots and tubers
- The remainder of the dietary energy is mainly derived from **cereal-based staple foods**

### In South Africa:

- 15% of population consume legumes daily
- Average per capita consumption: 37g/day *(Secondary Data Analyses)*
  - Pulses: 16g/day for men & 12g/day for women
  - Soy bean products: 21g/day for men & women *(PURE study, NW Province)*

# PROTEIN:

- The dietary component that evokes the widest array of complex scientific, economic, environmental and political reactions
- Viewed as the most expensive component in the diet
- Conventionally thought to use limited amounts
- Forms part of a healthy balanced diet
  
- Most consumed sources of protein:
  - Developed world: Animal products, followed by cereals
  - Developing world: Cereals followed by animal products

# HOW MUCH DO WE NEED?

## Influential factors for adequate intake levels

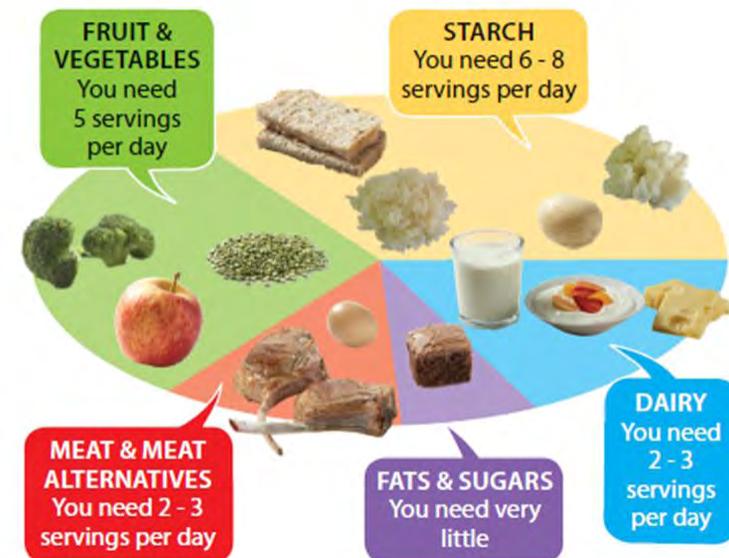
- **Dietary source of protein**
  - Estimates based on studies conducted with high-quality protein
  - Digestibility identified as important factor which could ↑ demand in plant-based diets
- **Age**
  - Children & Adolescents
  - Elderly
    - Prevalence of sarcopenia - although mostly related to physical activity
    - For diets limiting prot intake, sedentary elderly people are the population group most at risk of prot deficiency
- **Gender**
  - Women – apparent higher vulnerability
  - Pregnancy
- **Other factors**
  - Health status, e.g. HIV infected
  - Energy expenditure

(WHO Technical report, 935)



# HOW MUCH DO WE NEED?

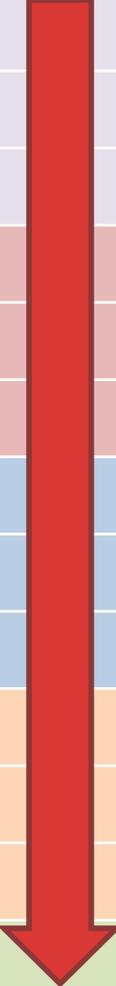
- **WHO Technical report (935) on protein and amino acid requirement in human nutrition (2007):**
  - **Best estimate for a population average requirement:**
    - 0.66 g protein/kg per day → 50g protein/day (75kg male)
    - Protein from various foods in the diet = 90g
- **To achieve protein requirements:**
  - **Food groups:**
    - ↑↑ **Meat and meat alternatives**
    - ↑ **Dairy**
    - ≈ **Starches and cereals**
    - ↓ **Vegetables and fruit**



# PROTEIN SOURCES

(USDA National Nutrient Database)

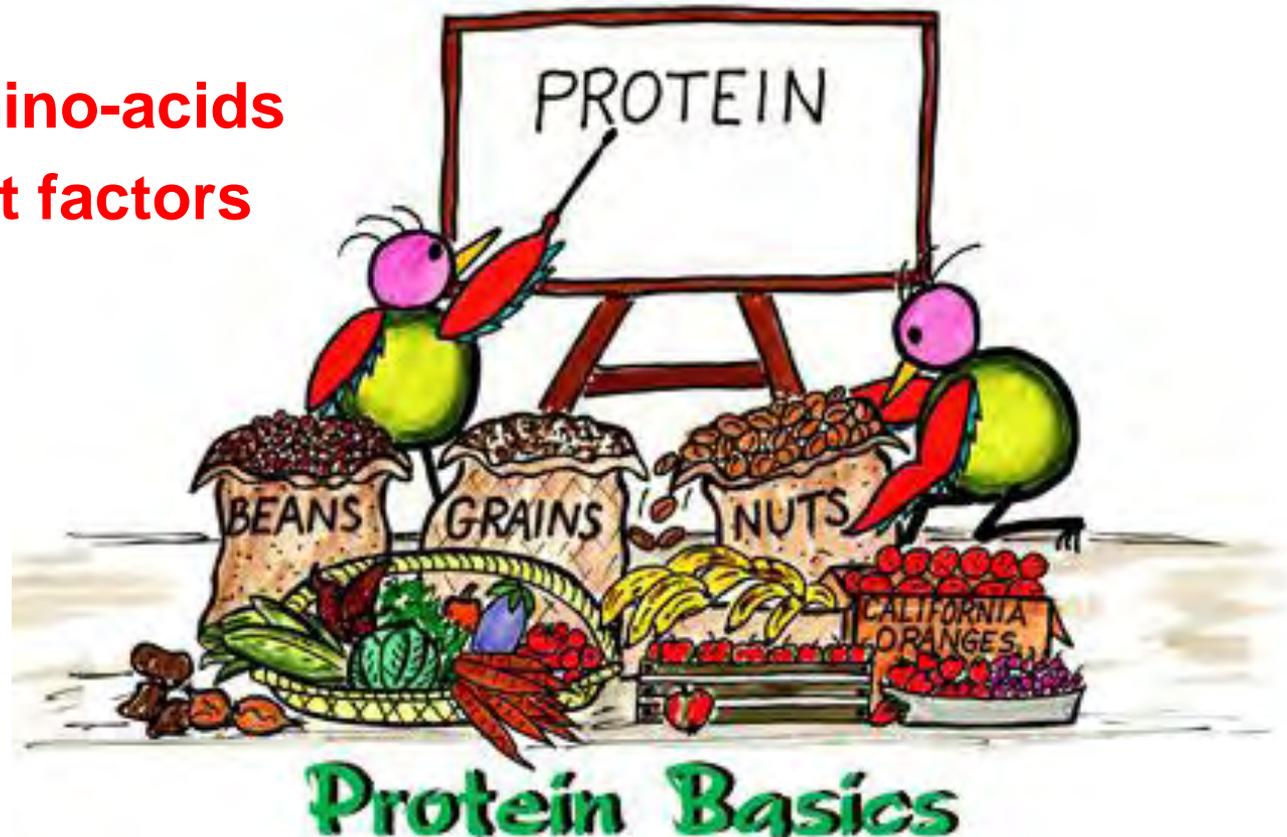
	One Serving	Protein amount (g)
Meat	85g beef, lean cooked	28
	85g chicken, cooked	26
	85g anchovy, canned in oil (solids)	25
Legumes	172g (1 cup) cooked soya beans	29
	196g (1 cup) boiled split peas	16
	1cup (256g) red kidney beans	13
Dairy	245 g (1 cup) milk	8
	28 g Cheddar cheese	7
	30g low fat cottage cheese	4
Starch & cereals	185g (1 cup) white rice	15
	219g (1 cup) oat bran	7
	25g (1 slice) whole wheat bread	3
Veg & Fruit	180g (1 cup) spinach	5
	1 (118g) banana	1



# PROTEIN QUALITY

In addition to QUANTITY, QUALITY of the protein should also be considered.

- 1) **Limiting Amino-acids**
- 2) **Anti-nutrient factors**



# PROTEIN QUALITY

Proteins made up of building blocks: Amino Acids (AA)

Humans need all AA in correct amounts and combinations for optimal growth & development

## Nonessential AA

- Delivered by foods, but can be produced in the body

## Essential AA

- 9 essential AA
- Need to be derived from foods

## Conditionally essential AA\*

- Sometime nonessential becomes essential – special circumstances
- E.g. Phenylalanine can be made into tyrosine, but if no phenylalanine tyrosine becomes essential

Essential	Non-essential
Histidine	Alanine
Isoleucine	Arginine*
Leucine	Aspartic acid
Lysine	Cysteine*
Methionine	Glutamic acid
Phenylalanine	Glutamine*
Threonine	Glycine*
Tryptophan	Proline*
Valine	Serine*
	Tyrosine*
	Asparagine*
	Seleno-cysteine

# PROTEIN QUALITY CONSIDERATIONS

## Limiting Amino Acids (AA)

- Some AA commonly limit nutritive value of proteins in the human diet:
  1. Methionine
  2. Lysine
  3. Tryptophan
  4. Threonine
- These AA concentrations are generally lower in plant based sources of protein
- Animal-based foods contain all essential AA in the correct proportions
- Correct combination of plant-based protein foods could increase the protein quality of the meal
  - E.g. Pulses in combination with cereal & other protein sources

Food source	Food	Range (mg/100g) from different studies		
		Lysine	Methionine	Cysteine
<b>Animal products</b>	Beef and Veal (edible flesh)	<b>531–591</b>	<b>147–182</b>	<b>78–182</b>
	Chicken (edible flesh)	<b>384–606</b>	<b>88–215</b>	<b>64–114</b>
	Offal	<b>375–506</b>	<b>138–181</b>	<b>62–132</b>
	Mutton and lamb (edible flesh)	<b>438–589</b>	<b>131–198</b>	<b>63–144</b>
	Hen eggs	<b>375–467</b>	<b>181–249</b>	<b>113–189</b>
	Fish (fresh, all types)	<b>380–689</b>	<b>120–290</b>	<b>28–144</b>
	Cow milk (untreated)	<b>396–531</b>	<b>147–171</b>	44–58
	Cheese	<b>476–674</b>	<b>140–210</b>	15–46
<b>Legumes</b>	African locust bean	<b>325–444</b>	38–100	50–113
	Chick-pea	<b>406–463</b>	34–106	50–94
	Cowpea	<b>394–479</b>	50–119	48–106
	Soya bean	<b>313–477</b>	53–114	51–114
<b>Cereals &amp; grain products</b>	Barley	159–250	<b>63–250</b>	<b>81–194</b>
	Maize	100–214	<b>53–175</b>	<b>38–200</b>
	Millet	100–244	<b>84–246</b>	<b>69–169</b>
	Rice (brown or husked)	198–263	<b>117–194</b>	30–79
	Rye (whole meal)	151–281	<b>59–181</b>	<b>85–156</b>
	Wheat (whole grain)	131–249	<b>63–156</b>	<b>111–212</b>
<b>Roots and tubers</b>	Cassava	<b>208–354</b>	<b>31–179</b>	<b>25–154</b>
	Potato	<b>163–488</b>	54–125	7–81

# PROTEIN QUALITY CONSIDERATIONS

## Anti-nutrient factors

Legumes contain certain compounds that have health benefits, but which can reduce the absorption of other essential nutrients

- E.g. *phytic acids*
  - Binds nutrients (incl. protein, iron, zinc, calcium & manganese)
  - Unable to be absorbed into the human body for use
  - Plant protein are often mixed with cereals for complementary feeding to increase protein quantity in meals - but both contain *phytic acid*
  - Widespread mineral deficiencies among infants & children, thus bioavailability from complementary food is a major concern
    - Iron absorption may be as low as 2 - 3% from porridge (whole-grain cereals & legumes 1g phytic acid per 100g product)
    - With lower levels of phytic acids ( $\pm 1$ mg phytic acid per 100g product), iron absorption would increase twofold.
    - To achieve degradation of phytic acid in plant based foods, complete enzymatic degradation of phytic acid is recommended, but not always possible.
  - Animal based sources of protein do not contain anti-nutrient factors & adding small amounts could increase absorption of nutrients

## Anti-nutrient factors in legumes

Phytic Acid

Saponins

Plant sterols

Phenolic compounds

Enzyme inhibitors

Lectins

Isoflavones (only in soybeans)

# A healthy, nutritious diet should:

- Contain a variety of foodstuffs
- From all the food groups
- Consider:
  1. Quantity (Portion size)
  2. Quality
    - *Nutrient density* – gram nutrients per unit of energy
    - Amino acid proportions – *essential amino acids*
  3. Bioavailability (How much of the nutrients in the food gets absorbed into the human body – *anti-nutrient factors*)

# Recommended balanced, diverse diet



# THE REALITY

Healthy, sustainable diet

**US\$2.50**

**VS**

**US\$0.60**

available per person per day

# THE REALITY

- Marginal daily intake of South Africa's lowest income consumers

(Duvenage & Schonfeldt, 2005)



- 532 g maize meal porridge (stiff + crumble)
- 150g brown bread
- 56ml milk
- 22g sugar

# PROTEIN CONTENT



Brown bread 13.5g

Milk 1.85g

Maize meal 14.4g

Sugar 0g

**Total protein in daily intake: 29.7g**  
**Less than one of three meals in balanced western diet**

# Affordability?

## SA Policy: Value-Added Tax Act No.89 of 1991

### *19 Basic foodstuffs zero-rated in South Africa*

Brown bread

Maize meal

Samp

Mealie rice

Dried mealies

***Lentils***

Pilchards/sardines in tins

***Edible legumes and pulses of leguminous plants***

Milk; Milk powder; Cultured milk; Dairy powder blend

Rice

Vegetables

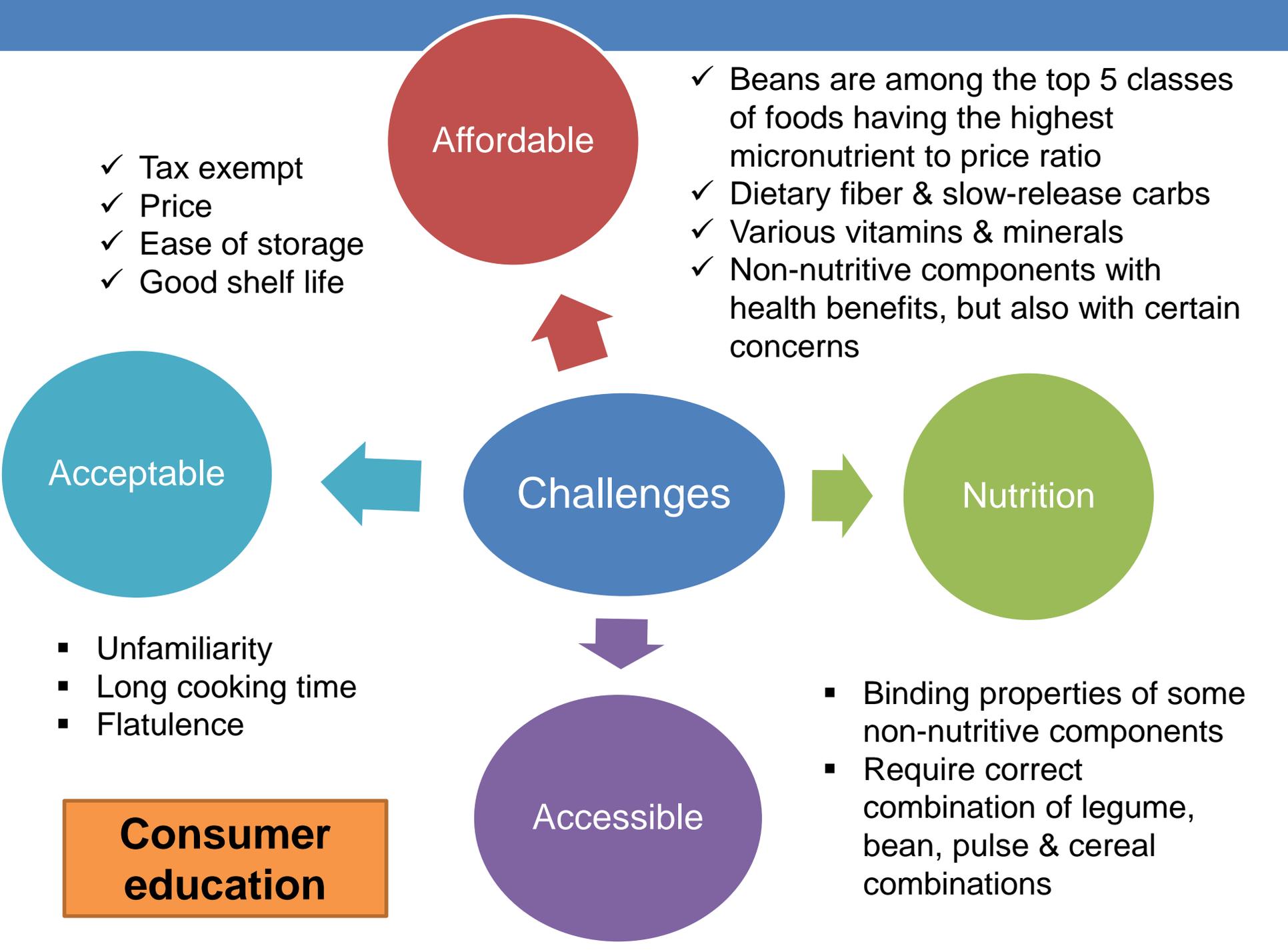
Fruit

Vegetable oil

***Dried beans***

Brown wheaten meal

Eggs



# Thank you

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