



The Wonder of the Wonder Bean!

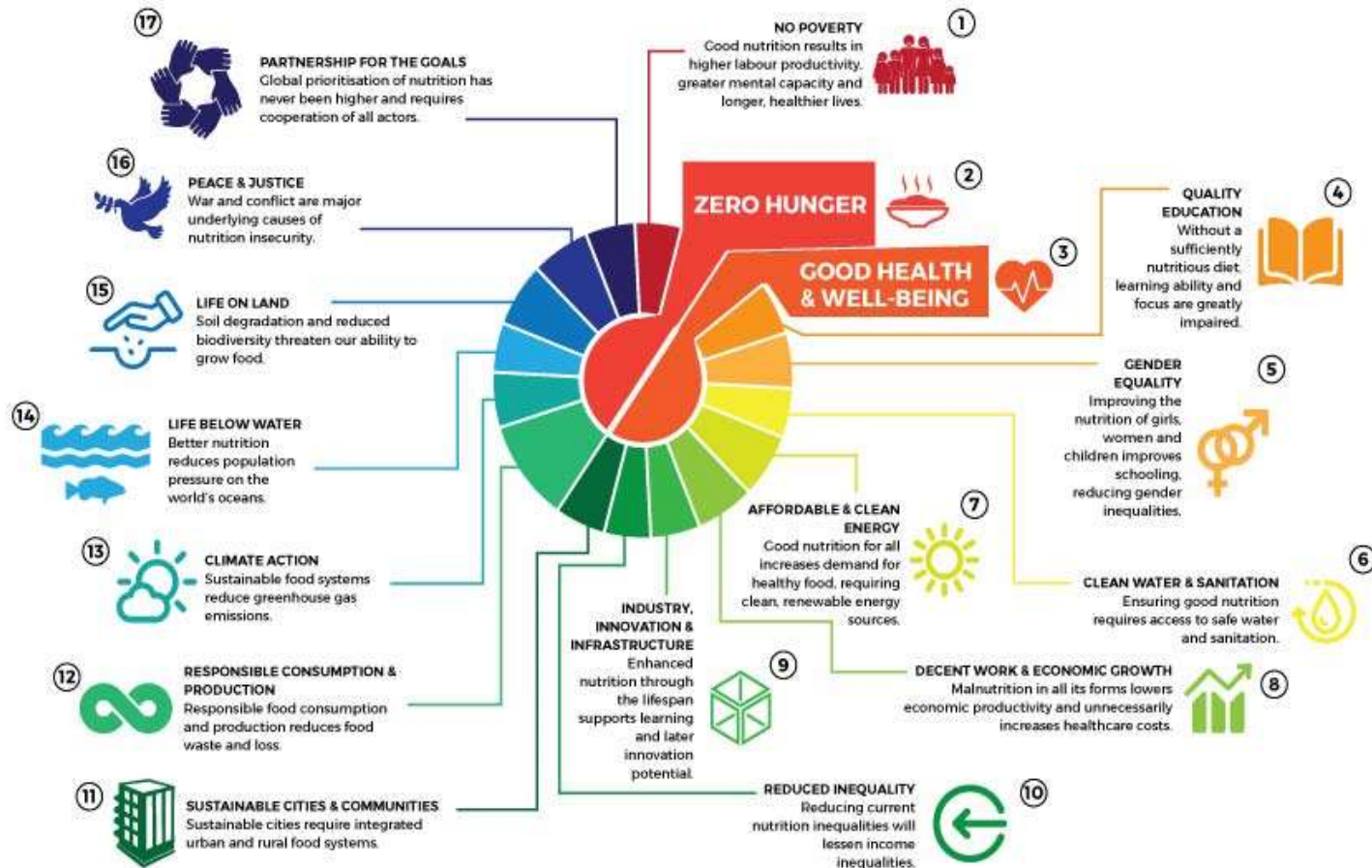
Dr Nita Khandekar
Principal Scientist & I/C CESPUP



Center of Excellence on Soybean Processing & Utilization, ICAR-CIAE, Bhopal



FOOD SECURITY AND NUTRITION & SUSTAINABLE DEVELOPMENT GOALS





The Preamble

To meet targets of SDG 2 by 2030, agrifood systems must be transformed in ways that ensure *they deliver lower cost and safe nutritious foods that make healthy diets more affordable for all, sustainably and inclusively.*

- FAO, 2022





The Preamble

- In 2019, India had 6.2 crore more people living with food insecurity - increased by 3.8% between 2014 and 2019.
- The Indian diet low in fruits, legumes, nuts, fish, and dairy - crucial for optimum growth; development and prevention of NCDs.
- 60-70% vegetarian - derives its protein from cereals & legumes.
- 40% below poverty line & does not have enough purchasing power to buy pulses, the major source of dietary proteins.

- Global nutrition report 2021

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Problems galore



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Recommended Dietary Allowances

Particulars	Body Wt. kg	Net Energy kcal/d	Protein g/d	Visible Fat g/d	Calcium mg/d	Iron mg/d
Man-Moderate worker	60	2730	60.0	25	600	17
Woman-Moderate worker	55	2230	55.0	25	600	21
Children 1-3 yrs	12.9	1060	16.7	27	600	9
Children 4-6 yrs	18.0	1350	20.1	25	600	13

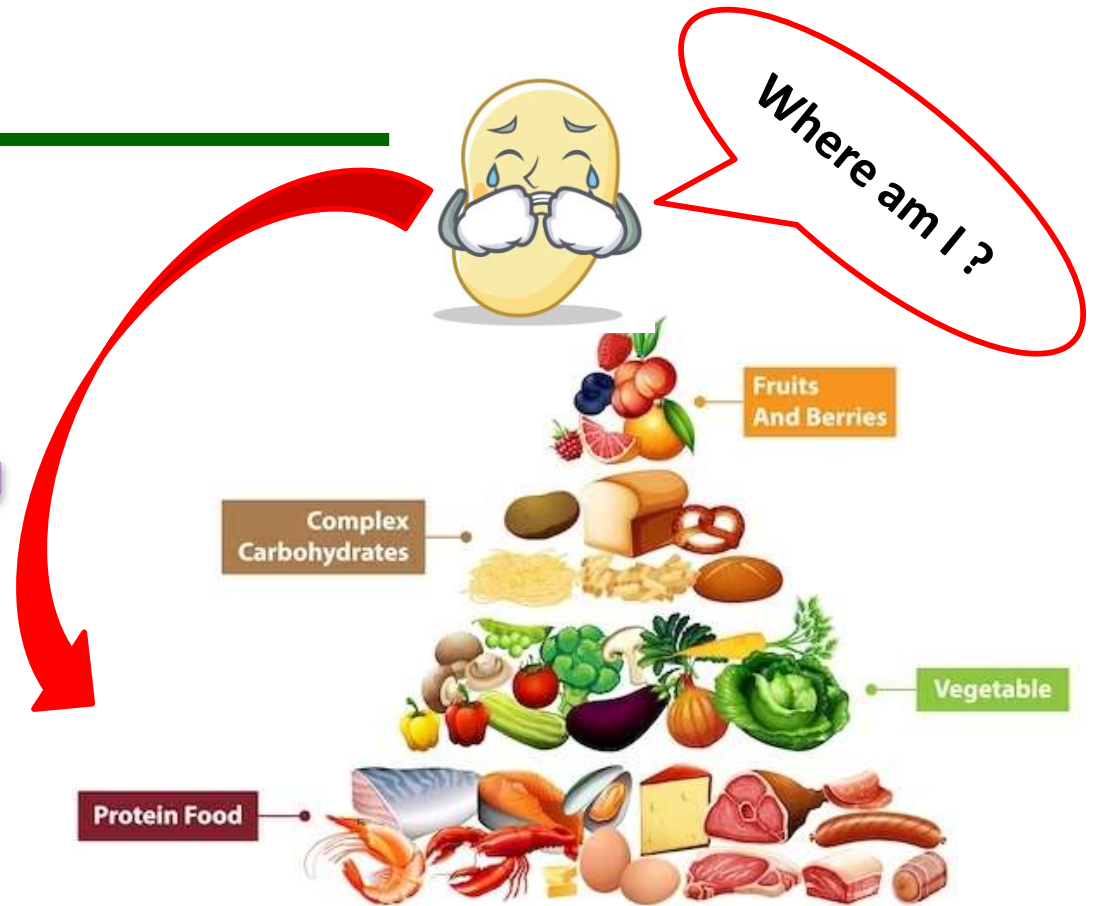


Malnutrition

- ❖ **Deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. Two broad groups of conditions**
 - ✓ Under nutrition
 - ✓ Overweight
- ❖ **In such a scenario soy protein, known as the wonder bean may play an important part for alleviation of the nutritional status in the country**
- ❖ **Least expensive - par with animal protein – properly processed no negative health effects - sustainable**



The Food Pyramid



CONVENTIONAL FOOD PYRAMID

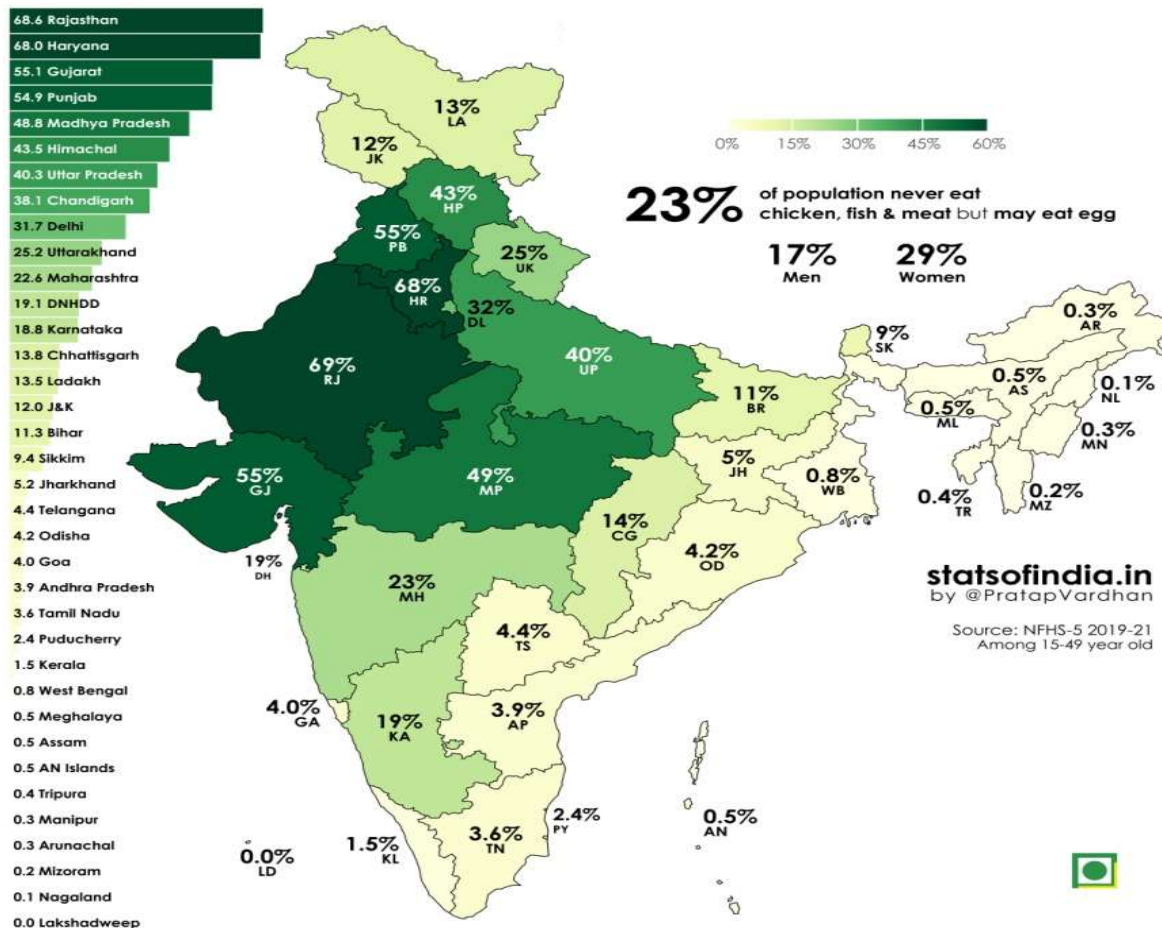
HEALTHY FOOD PYRAMID

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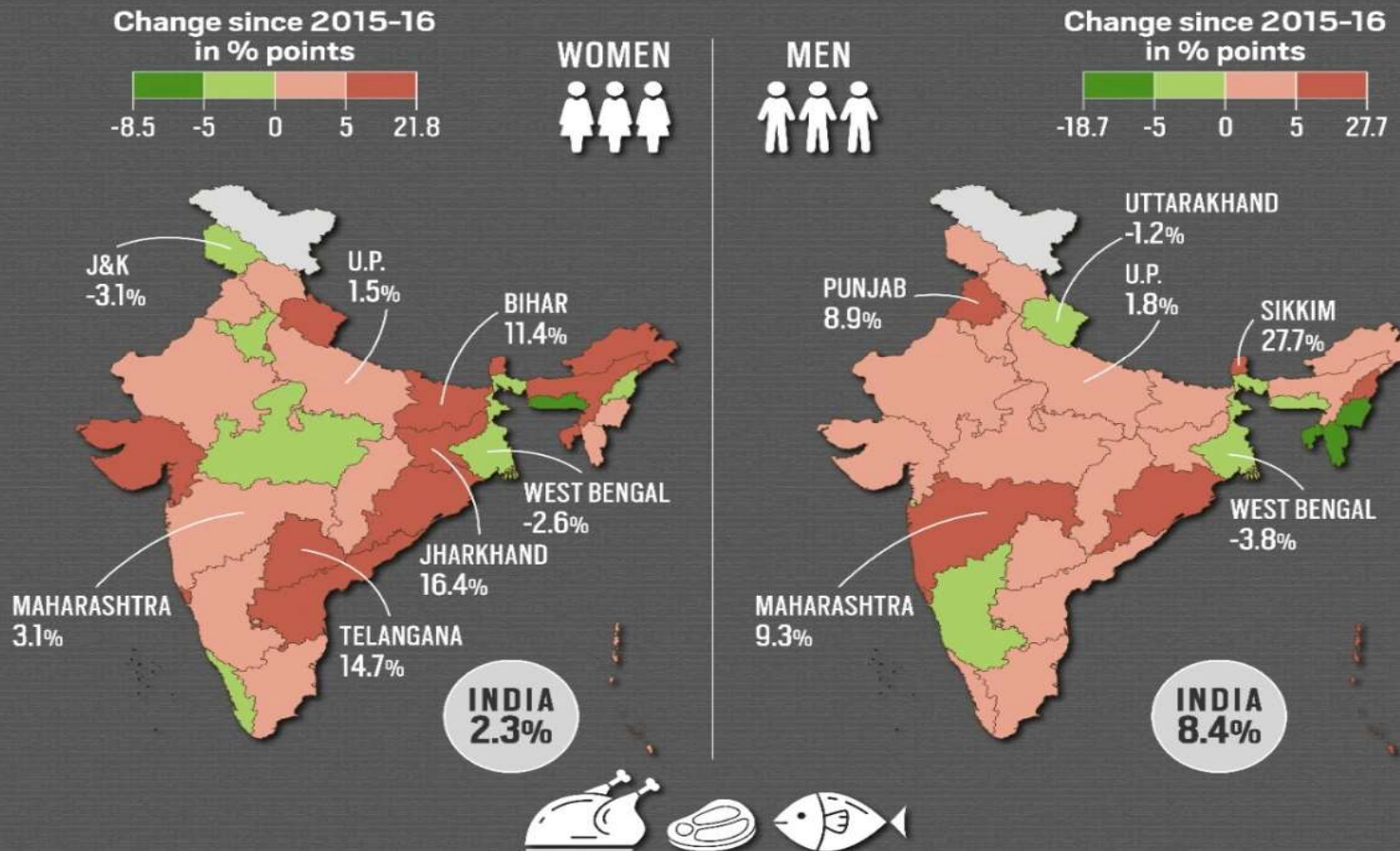
What Percentage does not eat meat?



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CONSUMPTION OF NON-VEG FOOD GROWING IN 25 STATES/UTs



Note: Data of people in 15-49 age group who eat fish, chicken or meat at least once a week



Change in GHG vis a vis change in diet

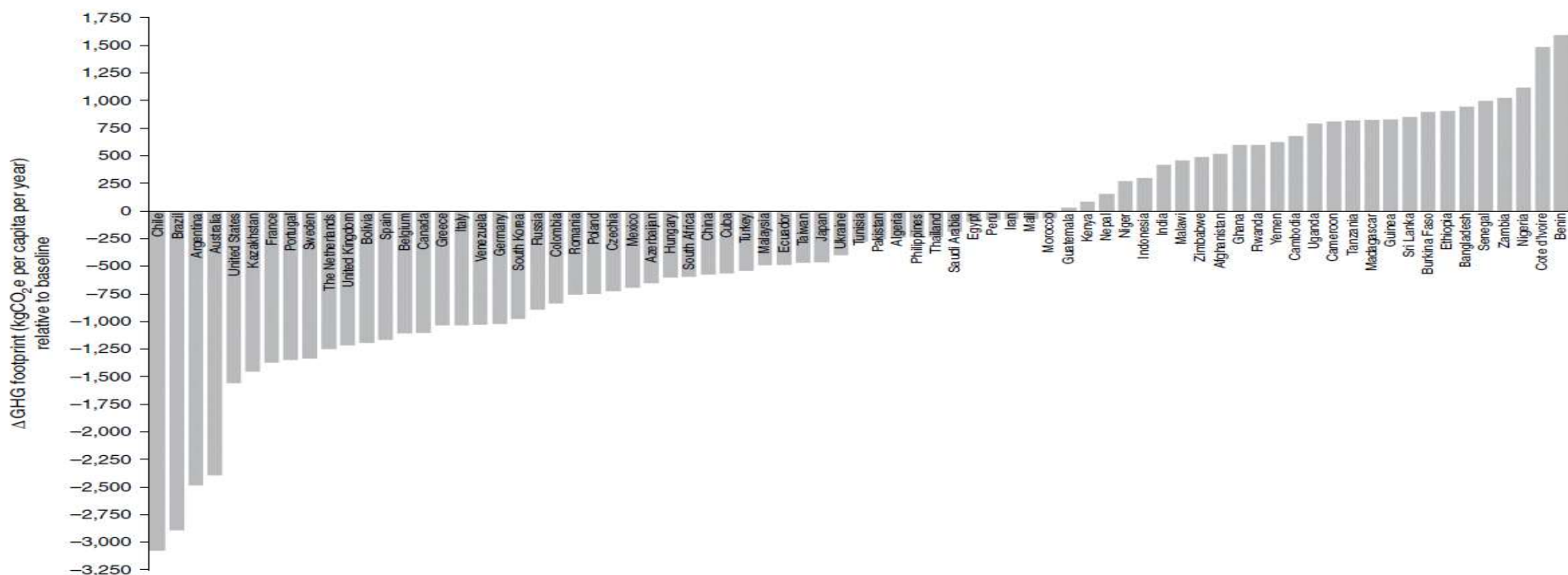
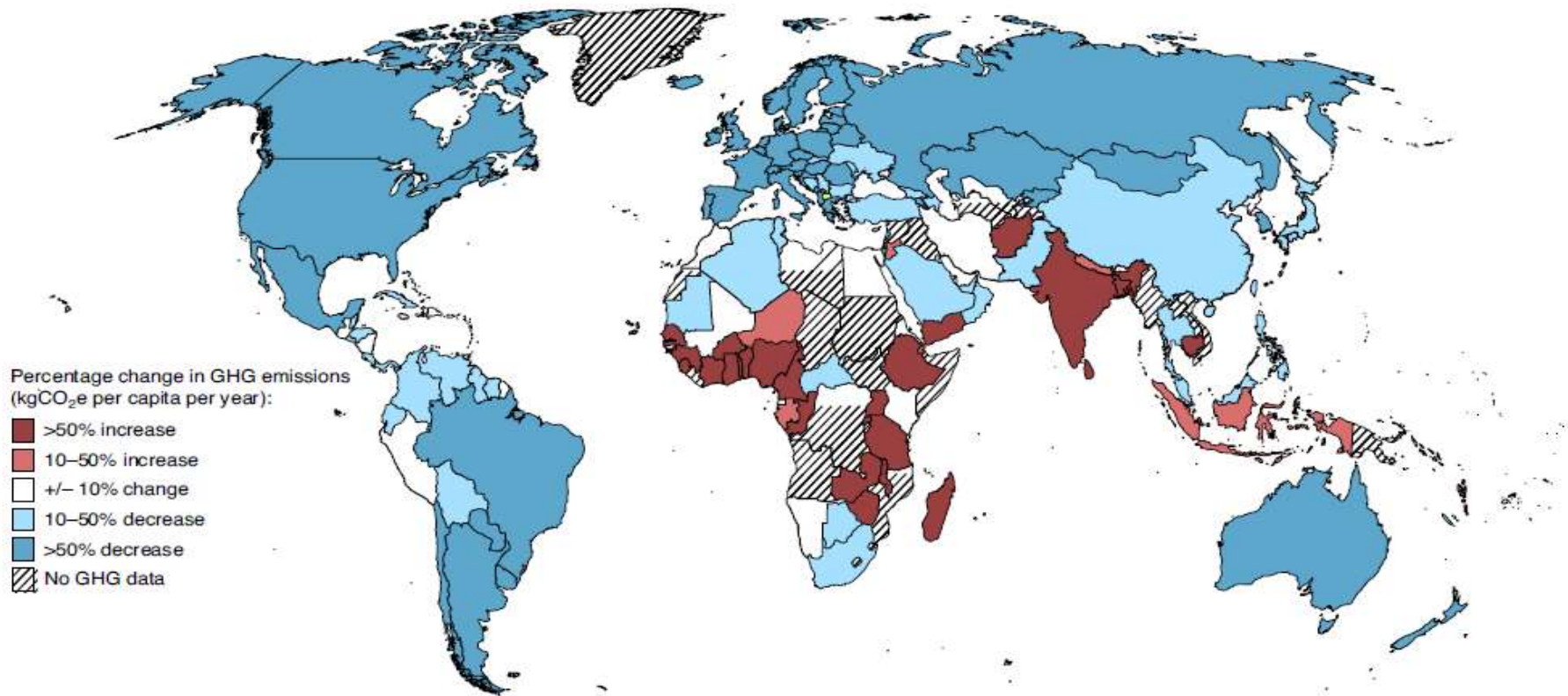


Fig. 1 | Country-specific change in per capita GHG emissions associated with the shift from current consumption patterns to the planetary health diet. The grey bars show change relative to the baseline in kilograms of carbon dioxide equivalent per capita per year. Given space limitations, only the 75 most populous countries (that is, the top 50% by population size) are displayed here. For detailed results from all 151 individual countries and territories, see Supplementary Table 2.



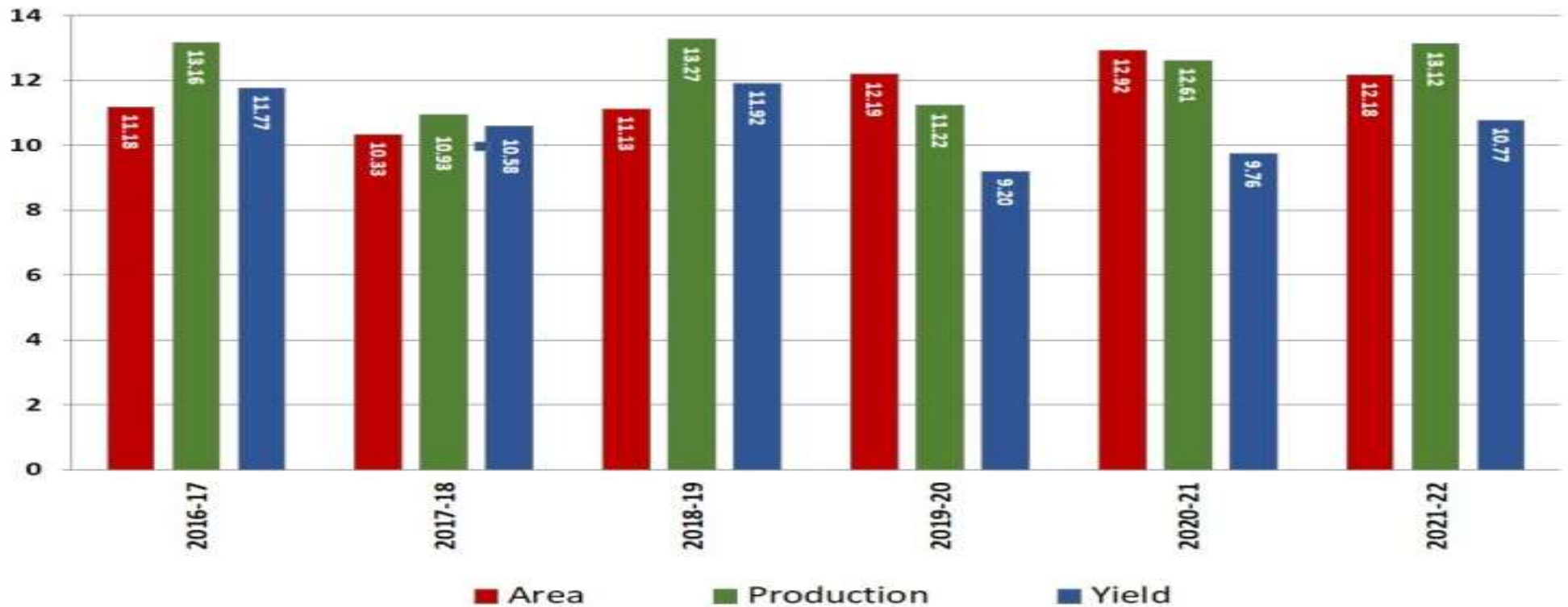
Change in GHG (kgCO₂ /capita/year





Soybean Factsheet

Scenario for Soybean in India



SOYBEANS ARE...

80%

MEAL The primary component of soybeans is meal.



97% **ANIMAL FEED**
97% of U.S. soybean meal is used to feed poultry and livestock.



3% **FOOD PRODUCTS**
3% of soybean meal is used in food products like protein alternatives and soymilk.

© 2015 United Soybean Board

**Increased
to
7 %**



SOY PRODUCTS

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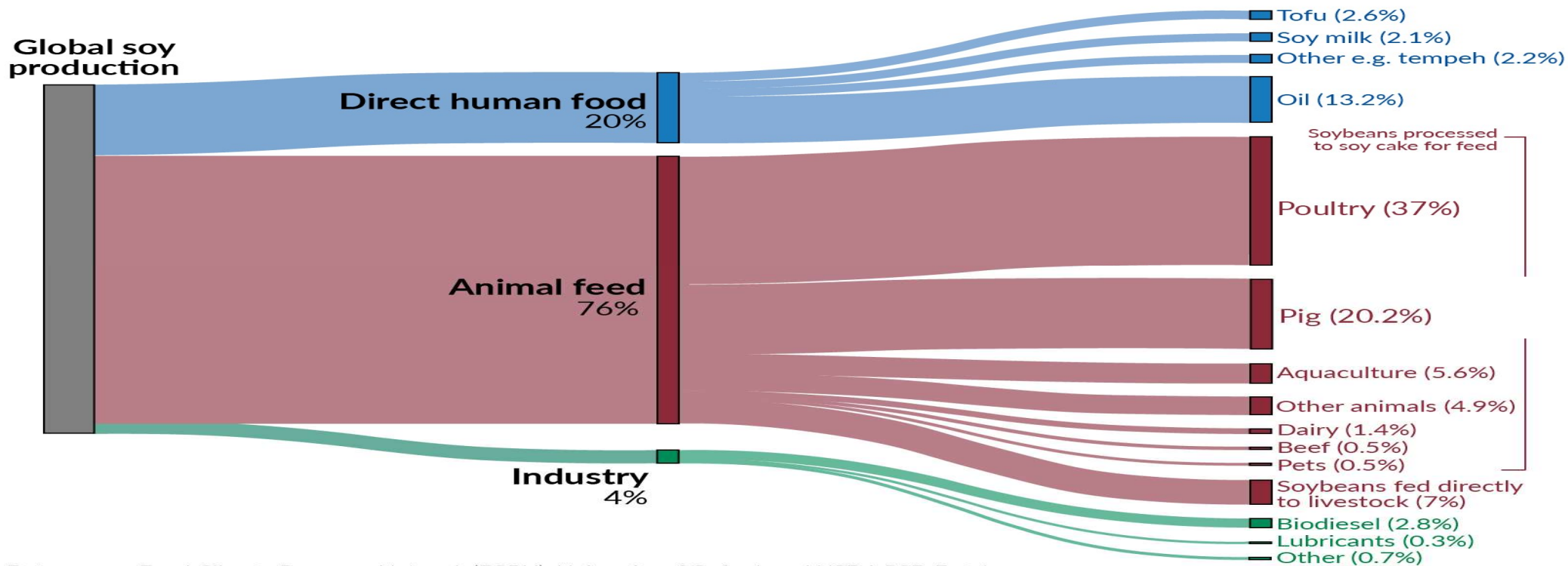


Soybean Factsheet

Our World in Data

The World's Soy: is it used for Food, Fuel, or Animal Feed?

Shown is the allocation of global soy production to its end uses by weight. This is based on data from 2017 to 2019.



Data source: Food Climate Resource Network (FCRN), University of Oxford; and USDA PSD Database.

OurWorldinData.org - Research and data to make progress against the world's largest problems.

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Soy as a superfood

- **Dr Swaminathan, 2017 India food secure - needs nutritional security**
- **Nutritional status need to be alleviated with low cost available options**
- **Soybean -power house of protein - categorized as an oilseed**
- **Important source of protein - especially for vegan or vegetarian diet**
- **The versatile bean is a rich source of:**
 - **Protein**
 - **All essential amino acids**
 - **Micronutrients: calcium, iron, magnesium, manganese, phosphorus, potassium, zinc, B vitamins, and vitamin C**
 - **Omega-3 and -6 fatty acids**
 - **Fiber**



Soybean vis-à-vis other pulses

Nutrients	Soybean	Red gram	Bengal gram	Green gram	Black gram
Protein, g	40	22	20	24	24
Fats, g	20	5	6	2	3
Carbohydrates, g	30	57	59	59	59
Calorie, cal	416	335	372	348	347
Calcium, mg	277	73	56	75	154
Phosphorus, mg	704	304	331	405	385
Iron, mg	16	5	5	8	8
Carotene, µg	335	132	59	49	38



Protein

- 250 grams equivalent to protein in 3 l. milk or 1 kg mutton or 24 eggs
- Compared to casein, >anti-oxidative ability-preventing lipid oxidation
- Protein digestibility-corrected amino acid score (PDCAAS) 1

PDCAAS of Food Proteins

Soy Protein	1.00	Peanut Meal	0.52
Casein and Whey	1.00	Rice	0.47
Egg White	1.00	Corn	0.42
Beef Protein	0.92	Whole Wheat	0.40
Pea Protein	0.73	What Gluten	0.25

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Fats

- Oil (20%) Approx. 40 percent calories derived from fat; most legumes (except peanuts) contain between 2 - 14 percent fat
- Soybeans are one of the few good plant sources of both essential fatty acids.

Most fat unsaturated (Polyunsaturated 63% -primarily linoleic acid essential omega-3 fatty acid; monounsaturated 23%- oleic acid & saturated 14% -palmitic acid)



Fibre and carbohydrates

Majority carbohydrates -classed as -dietary fiber- One serving provides approximately eight grams of dietary fiber

Contains 30 % carbohydrate that includes disaccharide sucrose (range 2.5–8.2%), trisaccharide raffinose (0.1–1.0%) and tetrasaccharide stachyose (1.4 to 4.1%).

Oligosaccharides - raffinose and stachyose -not digestible sugars - responsible for flatulence and abdominal discomfort - Degradation have potential health benefits



Health Benefits Of Soybean

Helps in improving
metabolic activity

Helps in healthy weight gain

Helps in preventing
cancer

Helps to boost heart
health

Helps to relieve
menopausal symptoms

Helps to boost
digestive health

Helps in improving
bone health

Helps in preventing
birth defects

Helps in improving blood
circulation

Helps in controlling diabetes





Bioactive compounds – Bane or Boon

Compound	Benefit	Adverse effect	Deactivation/ Degeneration
Trypsin Inhibitor	Anti-cancerous	Pancreatic hypertrophy	Moist heat more effective 20 minutes at 115°C or 30 minutes at 105-110°C Germination/ sprouting improves nutritional value Fermentation with microorganisms improves nutritional value & digestibility



Bioactive compounds – Bane or Boon

Bioactive compound	Benefit	Adverse effect ↓	Deactivation/ Degeneration
Phytic acid	Anti-cancerous, Antioxidants	bioavailability of minerals	Soaking, Sprouting, fermentation, Boiling
Isoflavones	Prevention of cardiovascular diseases, cancers, &menopausal symptoms	Hormonal imbalance	Prolonged cooking simmering or soaking



Bioactive compounds – Bane or Boon

Bioactive compound	Benefit	Adverse effect	Deactivation/ Degeneration
Saponins	Anticancer, antioxidant and anticholesterol activity	Membranolytic effects, toxic effects, adverse effects on animal growth and performance	Cooking processes
Goitrogens	Anti-cancer property	Interferes iodine uptake	Cooking processes
Lectins	Anti-cancer property	Haemolytic activity	Cooking processes & Germination



Food source containing anti-nutrients

Food Source	Anti-nutrients
Legumes, Potato and sweet corn, sweet potato, spinach, broccoli, Brussels sprouts and cucumber	Trypsin Inhibitor
Cereal grains, legume, oilseeds, nuts, grass family, tubers, pollen, spores and organic soil	Phytic acid
Legumes, lupine, faba bean, soybeans, kudzu, psoralea, Trifolium, Alfalfa, Peanut	Isoflavones
Soybean, cow pea, garden pea, alfalfa	Oligosaccharide
Soybeans, peas, potatoes, sugar beets, asparagus, beans and blackberries.	Saponins
Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Kale, Mustard Greens, Peaches, Peanuts, Radishes, Soy-Based Foods, Spinach, Strawberries.	Goitrogens
Castor bean, jack bean, soybean, and varieties of Phaseolus vulgaris	Lectins



Some Fallacies

Contains Estrogen ??

Wrong!

Soy contains phytoestrogens found in plants, not estrogen found in humans. Actually, phytoestrogens in the human body can lower the risk of cancer by blocking estrogen



Some Fallacies

Feminizes men??

Causes gynecomastia (enlarged breasts)

Dues to confusion around estrogen and phytoestrogen.

Studies concluded -isoflavone-rich soy and supplements don't affect men's testosterone levels nor estrogen levels

The Estrogen Dominance Guide, on the other hand, reports cow's milk can constitute 80% of our dietary intake of estrogen and that cows are given hormones to increase their growth and milk production, which can contribute to gynecomastia.





Some Fallacies

Disrupts growth and reproductive development

While the WAPF campaigns against giving infants soy-based formula, latest research shows infants on soy-based formula are at no greater health risk than those on dairy formula.



Soy Products Developed at ICAR-CIAE

Conventional Products	Novel Products
Soy milk & Paneer	Sprouted Soy milk & Paneer
Soy curd and mattha	Soy Butter
Soy nuggets	Soy Chaap
Full fat soy flour	Sprouted Soy Flour
Medium fat soy flour	Sprouted Soy Nuts
Defatted soy flour	Synbiotic Chocolate
Soy ice cream/srikhand/amarkhand	Probiotic soybased milk powder
Soy fortified biscuits & Muffins	Soybean hull based dietary fiber
Soy sattu	





The Take home

- **Soy has either a beneficial or neutral effect on various health conditions**
- **This nutrient-dense source of protein that can safely be consumed several times a week,**
- **Soybean has much to offer in improving the nutritional status**

- **Need to remove falsely attached stigma to soybean**
- **Need to intensively promote its food uses to contribute to mitigate the nutritional problems**
- **Consorted efforts in this direction will go a long way in achieving nutritional security world over.**
- **However It's a long road to travel before soybean is incorporated in diets like other popular legumes in the country.**



Thank you



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