SMART FOOD

Food that is Good for You, the Planet and the Farmer

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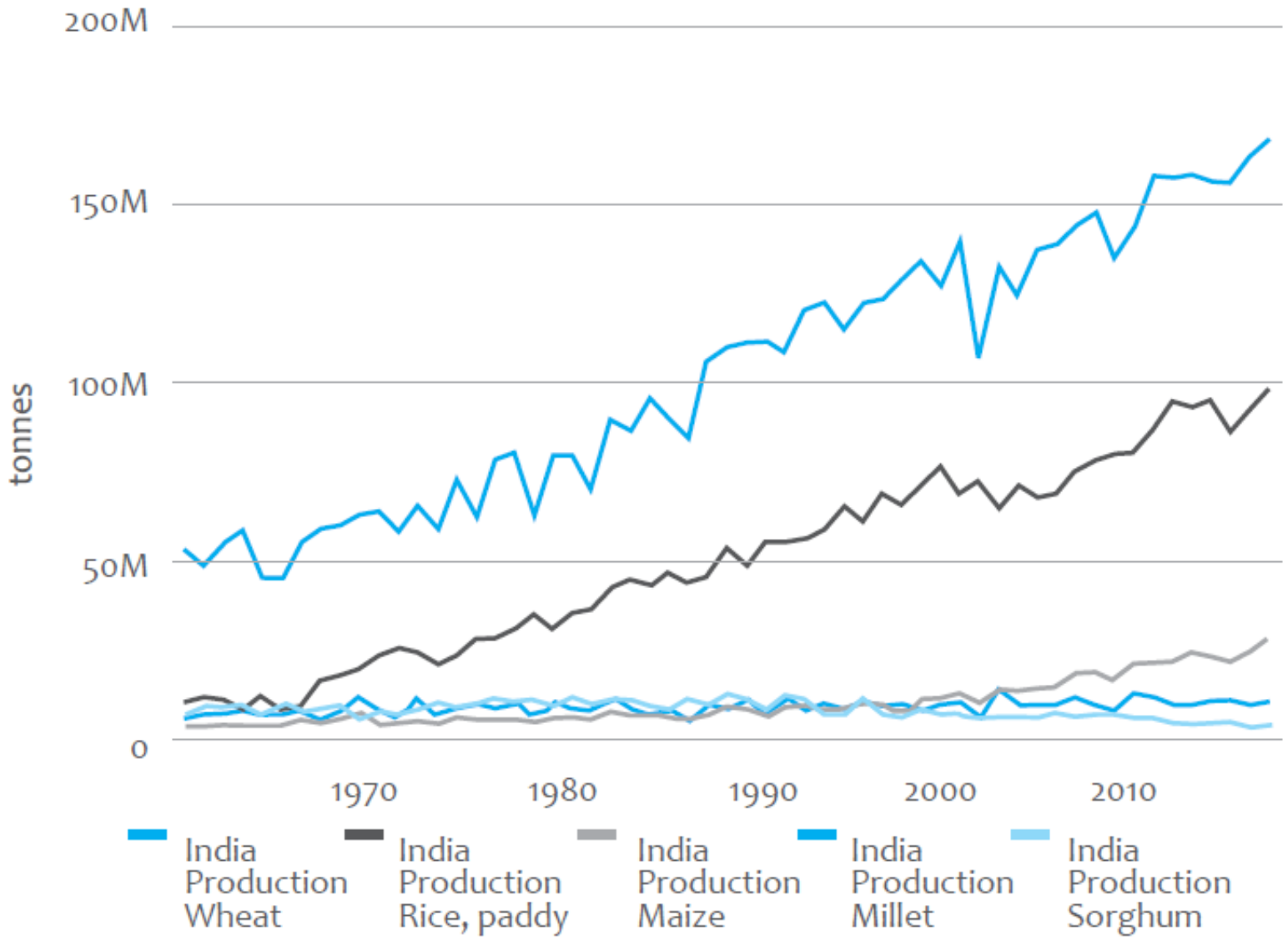
Recipe
of the day
HerZindagi

Flow of Presentation

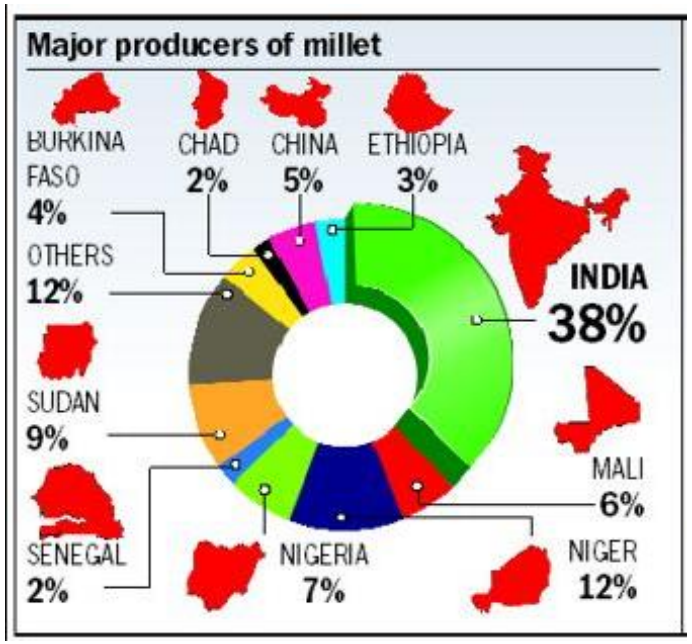
1. **Indian Agriculture and Food System**
   Climate, Consumer and Farmers
2. **Concept of SMART FOOD**
   Classification, Benefits, Scope & Importance, Challenges
3. **Various Initiatives of Public, Private and NGOs**
4. **Conclusion & way foreword**
5. **Relevant Research and Cases**

Production in India of rice, wheat, maize, millets and sorghum from 1961 to 2017

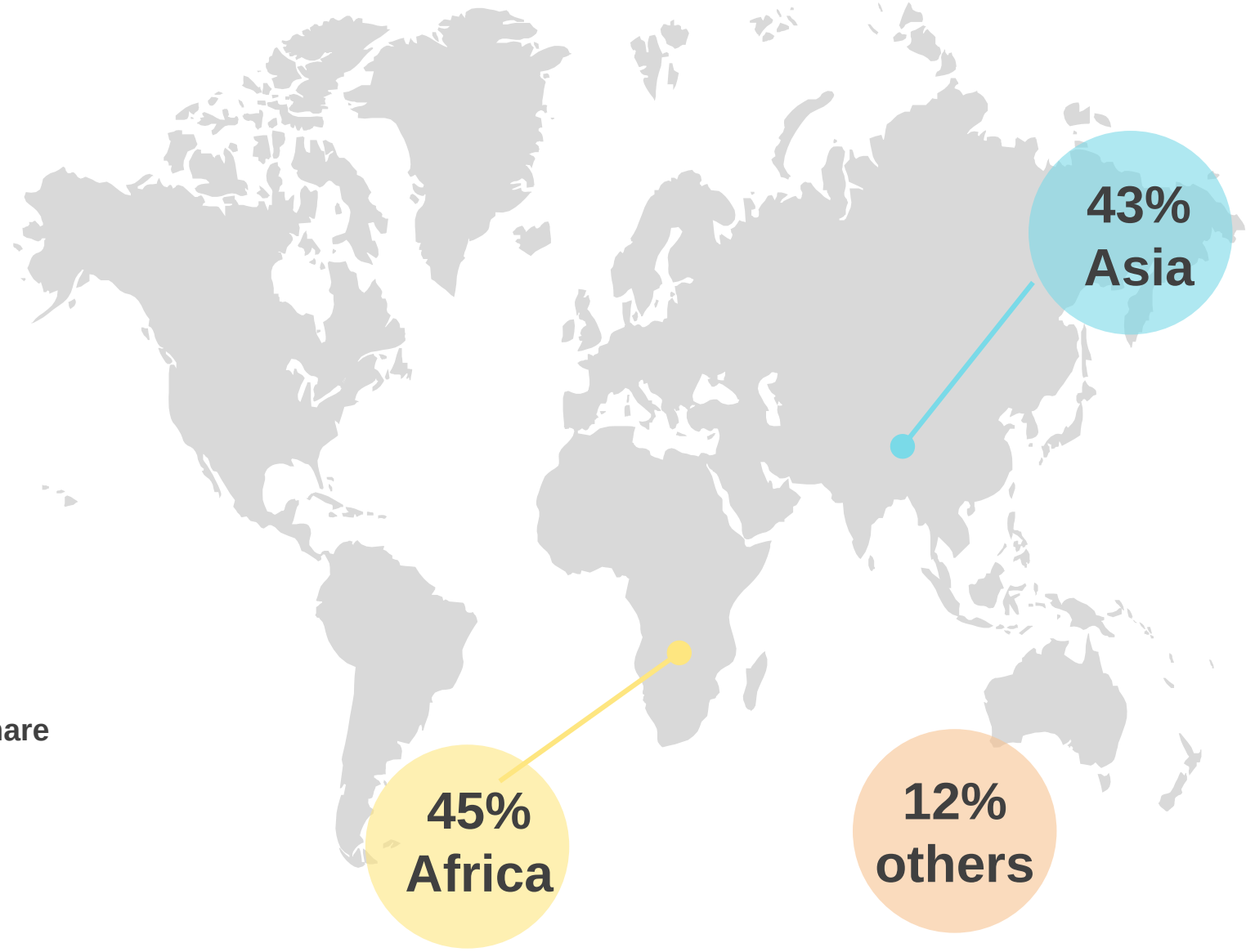


Source: FAO STAT (Oct 11, 2018)

Major Producer of Nutri-Cereals



Major Millet growing countries and their share



Source: FAO, 2021

Global Scenario in Nutri-cereals Production

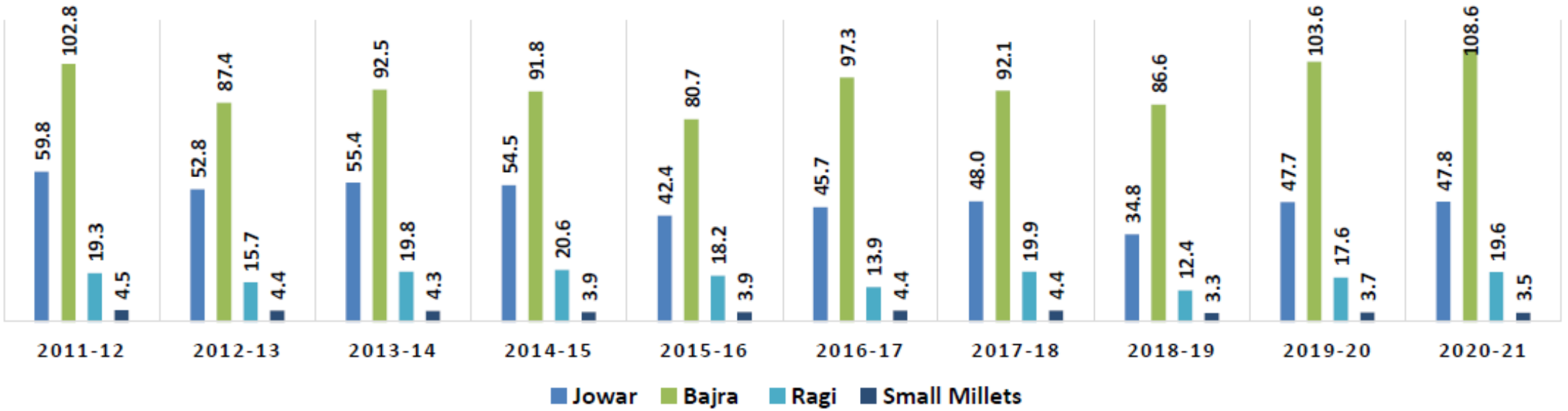
Millet Production: Country Wise							%age share
		Production in (000) MT					
Sr No.	Country	2016	2017	2018	2019	2020	2020
1	India	10,280.00	11,560.00	11,640.00	10,235.83	12,490.00	41.0%
2	Niger	3,886.08	3,790.03	3,856.34	3,270.45	3,508.90	11.5%
3	China P Rp	1,394.09	1,996.86	1,565.96	2,300.00	2,300.00	7.5%
4	Nigeria	1,552.58	1,500.00	2,240.74	2,000.00	2,000.00	6.6%
5	Mali	1,806.56	1,806.56	1,840.32	1,878.53	1,921.17	6.3%
6	Ethiopia	1,017.06	1,077.62	982.96	1,125.96	1,218.58	4.0%
7	Senegal	606.85	568.94	574	807.04	1,144.86	3.8%
8	Burkina Faso	905.07	828.23	1,189.08	970.18	957	3.1%
9	Chad	725.68	660.17	756.62	717.62	686.58	2.3%
10	Sudan	1,449.00	954	2,647.00	1,133.00	484.96	1.6%

Source: FAO, 2021

- India produces >170 lakh ton (80% of Asia's & 20% of global production)
- Global average yield: 1229 kg/ha, India (1239 kg/ha)

Production of Nutri Cereals during last 10 yrs (India)

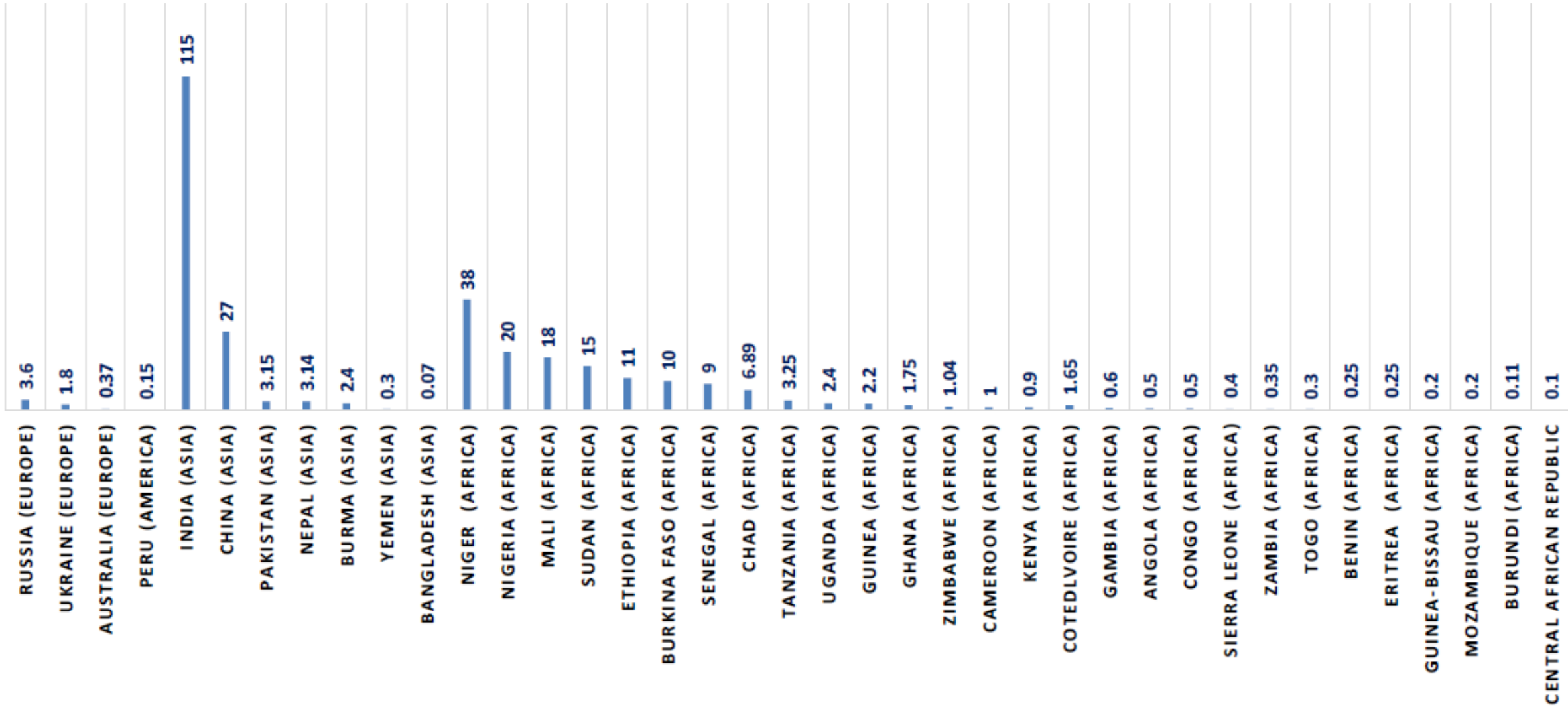
Yield in lakh ton



Crop	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Jowar	59.8	52.8	55.4	54.5	42.4	45.7	48.0	34.8	47.7	47.8
Bajra	102.8	87.4	92.5	91.8	80.7	97.3	92.1	86.6	103.6	108.6
Ragi	19.3	15.7	19.8	20.6	18.2	13.9	19.9	12.4	17.6	19.6
Small Millets	4.5	4.4	4.3	3.9	3.9	4.4	4.4	3.3	3.7	3.5
Total Nutri Cereals	**186.4**	**160.3**	**172.0**	**170.8**	**145.2**	**161.2**	**164.4**	**137.1**	**172.6**	**179.6**

Source: CSO, 2021

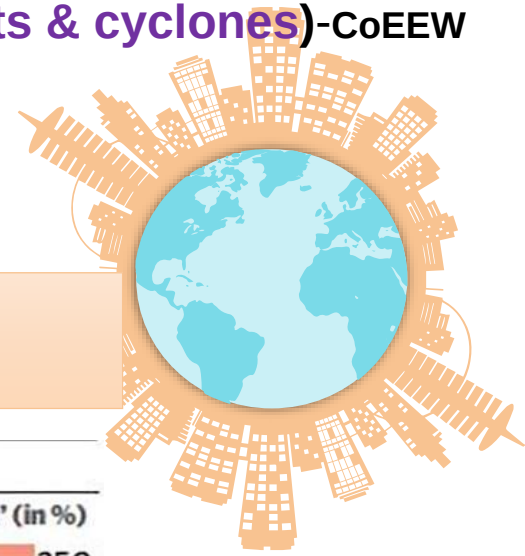
Millets Estimates of major countries (lakh ton)



Global and the India's scenario on Climate Change and Nutrition

More than 80 percent of India's population lives in districts **highly vulnerable to extreme hydro-met disasters**

Assam, AP, MH, KA, Bihar are highly vulnerable to extreme climate events (**floods, droughts & cyclones**)-**CoEEW**

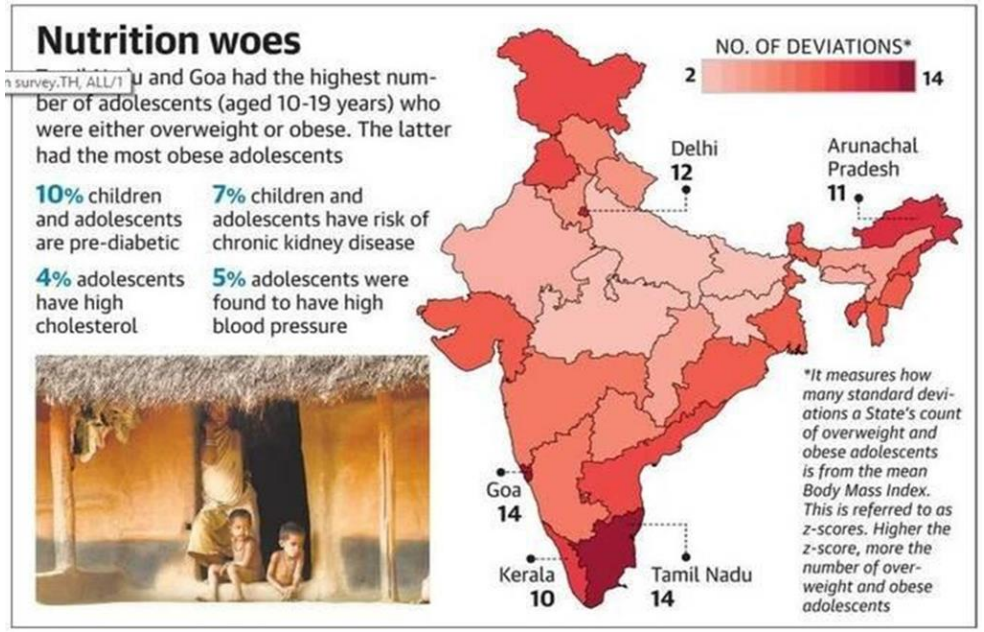


Global Climate Risk Index: Mozambique-1st (2.67) India -7th (16.67)

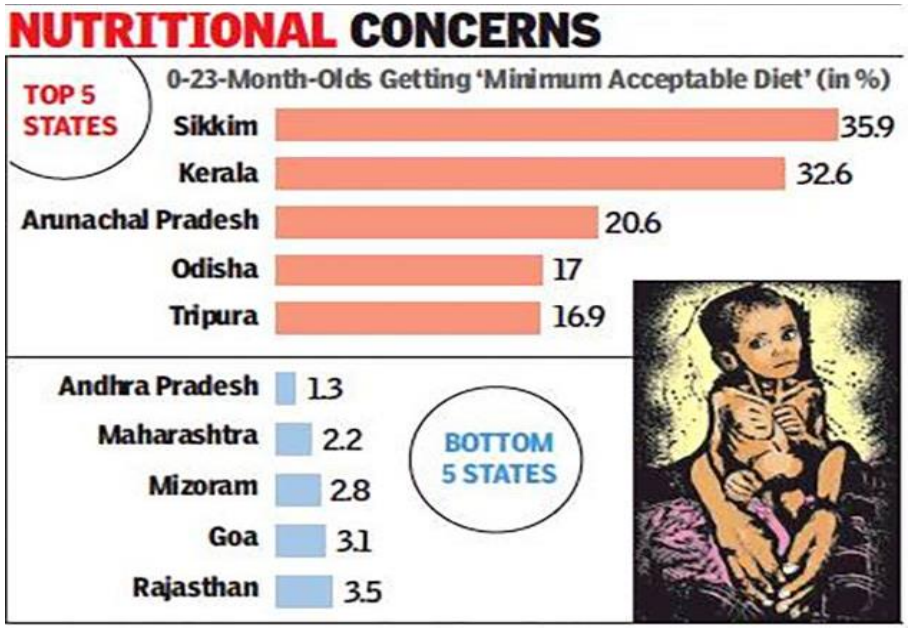
Climate Vulnerability Index (CVI): Assam -1st Rank (0.616), Karnataka 4th Rank (0.465)

Global Hunger Index, 2022:

India ranks **107th** out of 121 countries **(29.1)**
India has a level of hunger that is **serious**.



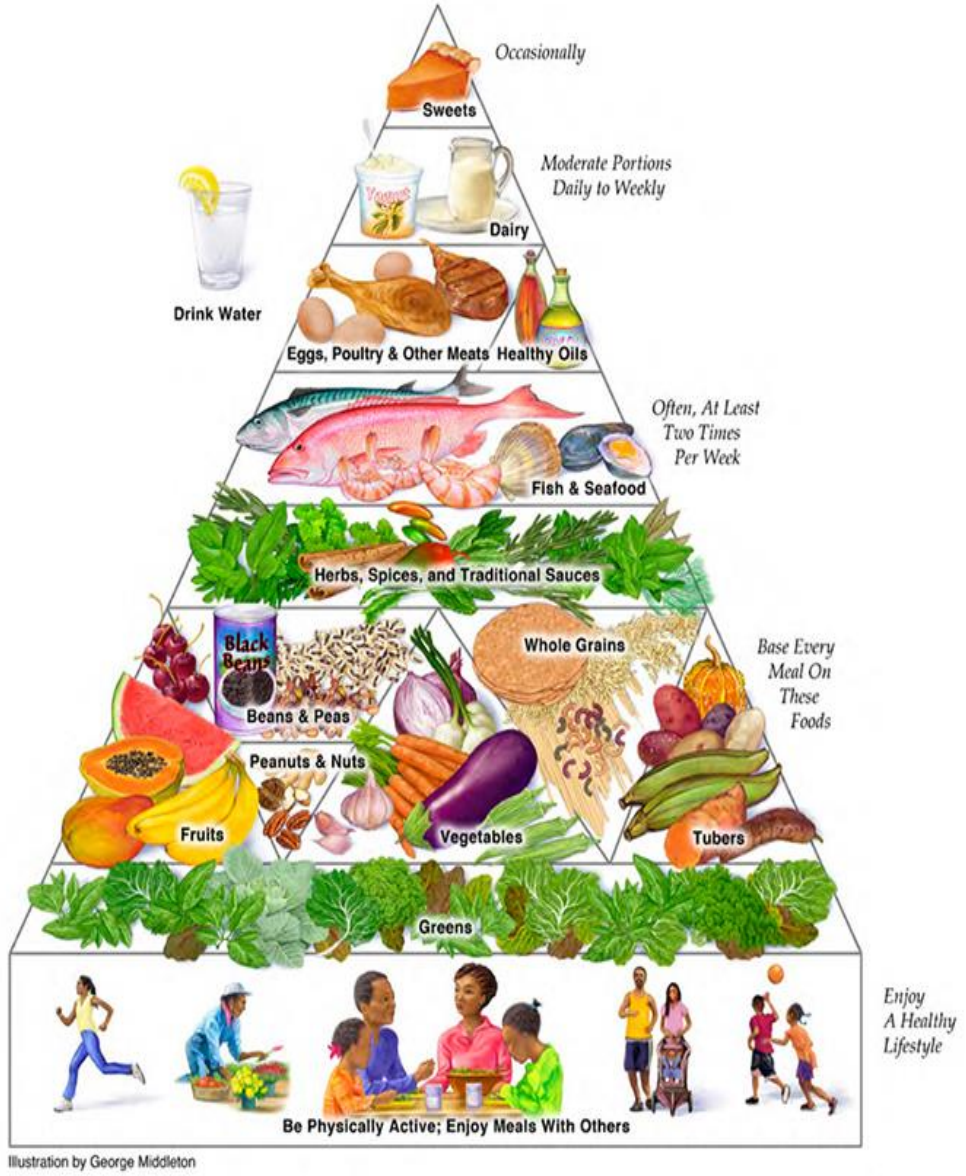
~ 62.4 million people have diabetes in India



https://www.ceew.in/publications/mapping-climate-change-vulnerability-index-of-india-a-district-level-assessment

How is our Plate of Meals filled now

- **Staples** comprise about **70 per cent of a food plate** and are eaten up to three times a day.
- **Staple grains** such as **rice and wheat**, are often highly refined and the least nutritious part of the meal.
- **Rice, wheat** and **maize provide** over 50 percent of the calories globally.
- Unfortunately, there has been a shift from **traditional high fiber** to **highly refined grains** of **higher Glycemic Index** (GI), and thus the **Glycemic Load (GL)** of **Indian diets is very high**
- Wheat and rice contribute 70 percent of the carbohydrate intake of Indians



Challenge in diversifying staples

- ✓ The biggest challenge in diversifying staples is that we have a '**Food System Divide'.**
- ✓ For decades, the vast majority of global investments have been poured into just three crops-**rice**, **wheat** and **maize**-the '**Big3**'.
- ✓ This includes policy support, private industry investment, R&D, product development and even development aid.
- ✓ In India, these investments are mainly around rice and wheat

Seminar Objectives

- To understand the concept of Smart Food and its significance
- To discuss various initiatives of public, NGO and private sectors on Smart Food
- To review related research findings and case studies

FAO Identified Future Smart Foods

Potential Future Smart Food in eight countries in South and Southeast Asia

Cereals	Roots and tubers	Pulses	Fruits and vegetables	Nuts, seeds and spices
Amaranth	Elephant foot yam	Black gram	Chayote	Linseed
Buckwheat	Fancy yam	Cow pea	Drumstick	Nepali butter tree
Finger millet	Purple yam	Faba bean	Fenugreek	Nepali pepper
Foxtail millet	Swamp taro	Grass pea	Indian gooseberry	Perilla
Grain amaranth	Sweet potato	Horse gram	Jackfruit	Walnut
Proso millet	Taro	Lentil	Pumpkin	
Quinoa		Mung bean	Roselle	
Sorghum		Rice bean	Snake gourd	
Specialty rice		Soybean	Wood apple	
Tartary buckwheat				

Source: Future Smart Food, FAO, 2021

SMART FOOD

SMART FOOD

Food, which is food that fulfills all the criteria of being

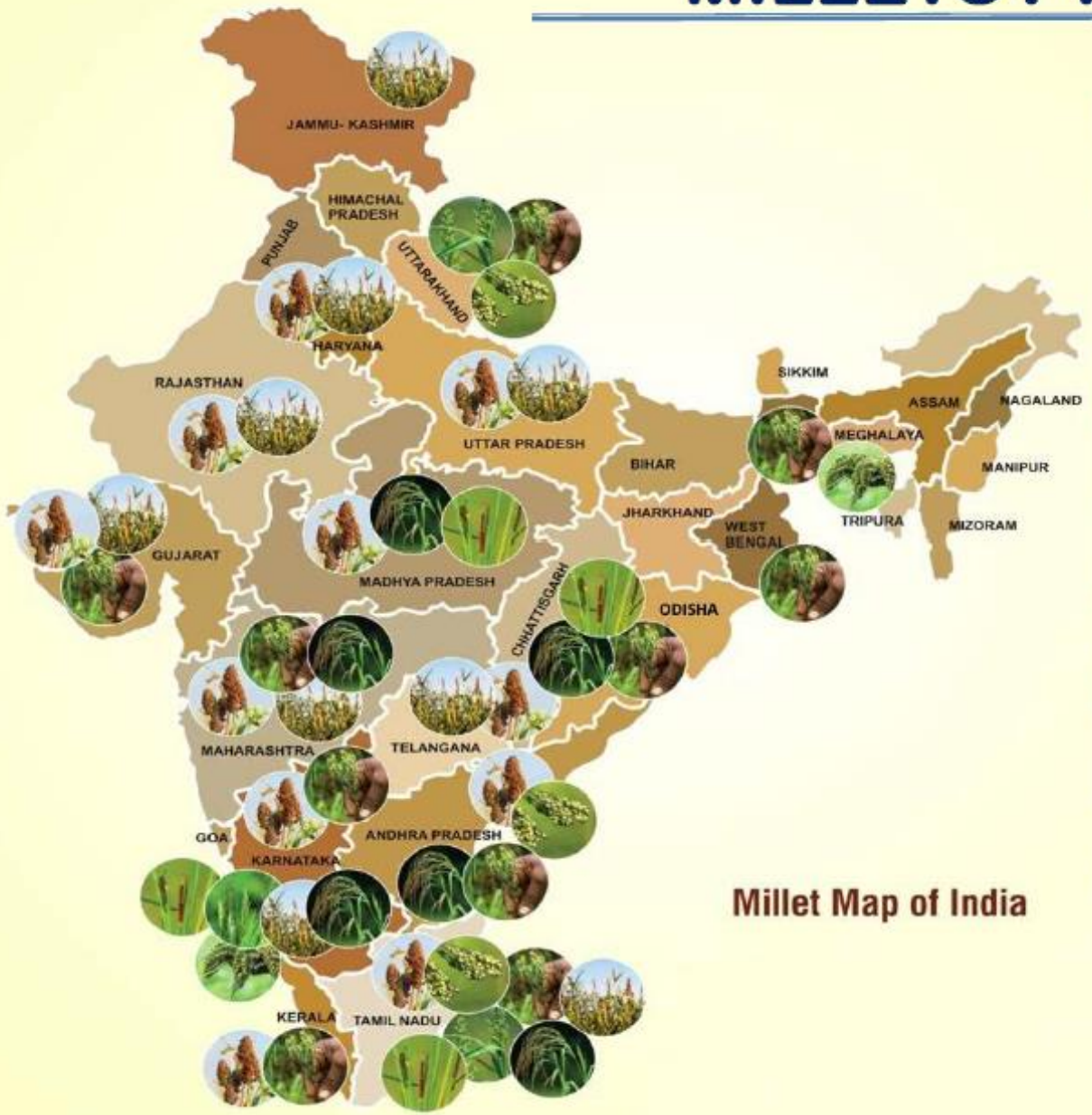
✓ Good for You (**nutritious and healthy**)

✓ Good for the Planet (e.g., **low carbon footprint**)

✓ Good for the Farmer (e.g., **climate-resilient and survive with less water**)

Smart Food contributes to addressing some of the largest issues, globally and in India, in unison: **poor diets** (malnutrition to obesity); **environmental issues** (water scarcity and environmental degradation); and **rural poverty**.

MILLETS : THE NUTRI-CEREALS



Millet Map of India

- Earliest evidence found in Indus civilization : 3000 BC.
- Ancient food grains first plants domesticated for food.
- Grown in 131 countries. Millets traditional food for 59 crore people in Asia & Africa.

Millets are collective group of small seeded annual grasses that are grown as grain crops, primarily on marginal land in dry areas of temperate, sub tropical and tropical regions.

(http://www.fao.org/3/w1808e/w1808e0c.htm)

Top 5 States	Millet Crops
Rajasthan	Bajra/Sorghum
Karnataka	Jowar/Ragi
Maharashtra	Ragi/Jowar
Uttar Pradesh	Bajra
Haryana	Bajra

India produces around 17million MT of millets
India accounts for 80% of Asia's and 20% of global production
India's average yield of millets at 1239 kg/ ha is higher than the global average (1229 kg/ha)

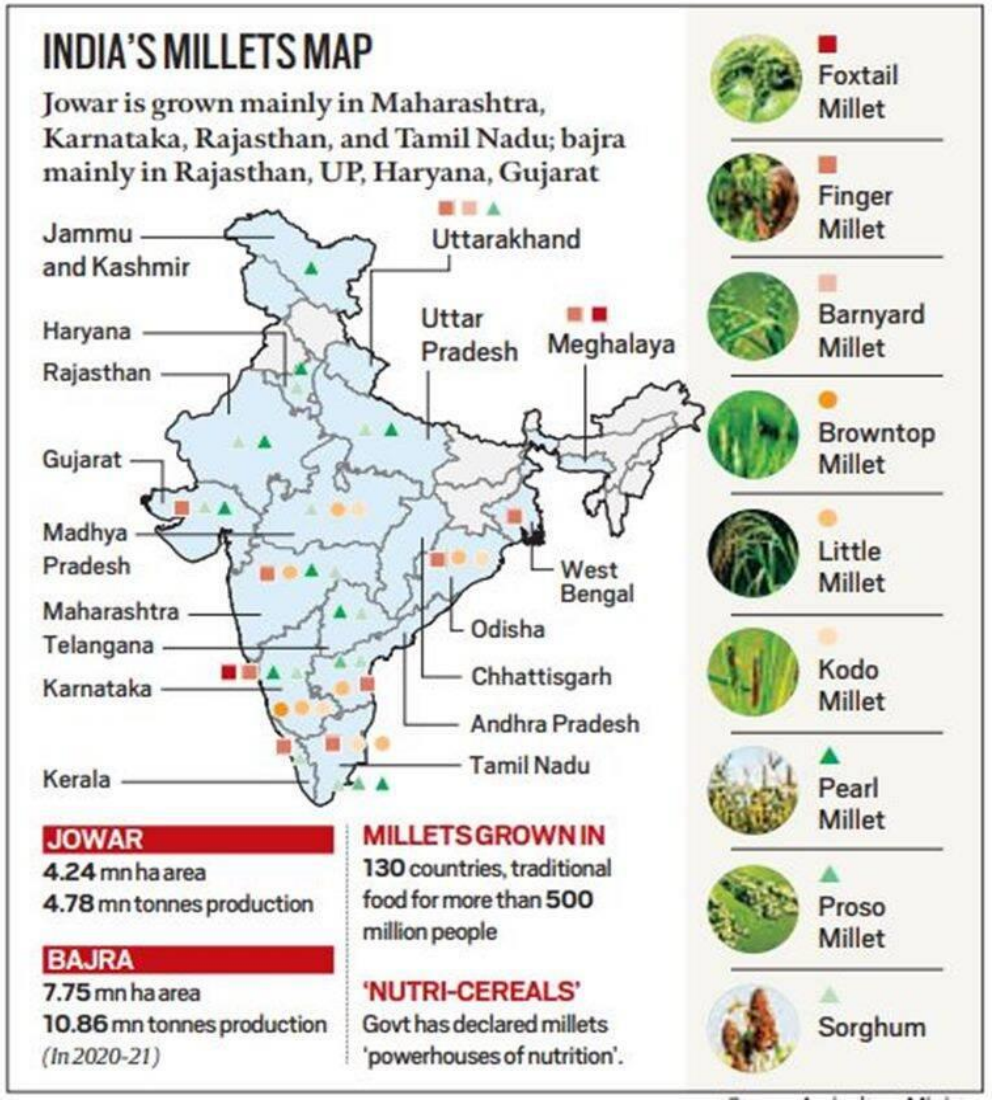
India is the **largest producer of millets in the world** with a share of **41 per cent in 2020.**

The major millets producing states in India are Rajasthan, Uttar Pradesh, Haryana, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and Telangana.

India is the largest producer **as well as the largest exporter of cereal products** in the world.

India's export of cereals stood at **Rs. 96,011.42 Crore** / 12,872.64 USD Millions during the year 2021-22.

Rice - India's total cereals export share **75% (in value terms)** in 2021-22



Other cereals including wheat represent only a 25 %

How Good for Consumer?

Key Features

- ✓ Finger millet has 3 times the amount of calcium than milk
- ✓ Very high in iron and zinc
- ✓ Low Glycemic (GI) Index
- ✓ Good levels of protein
- ✓ High in fiber

Key Features

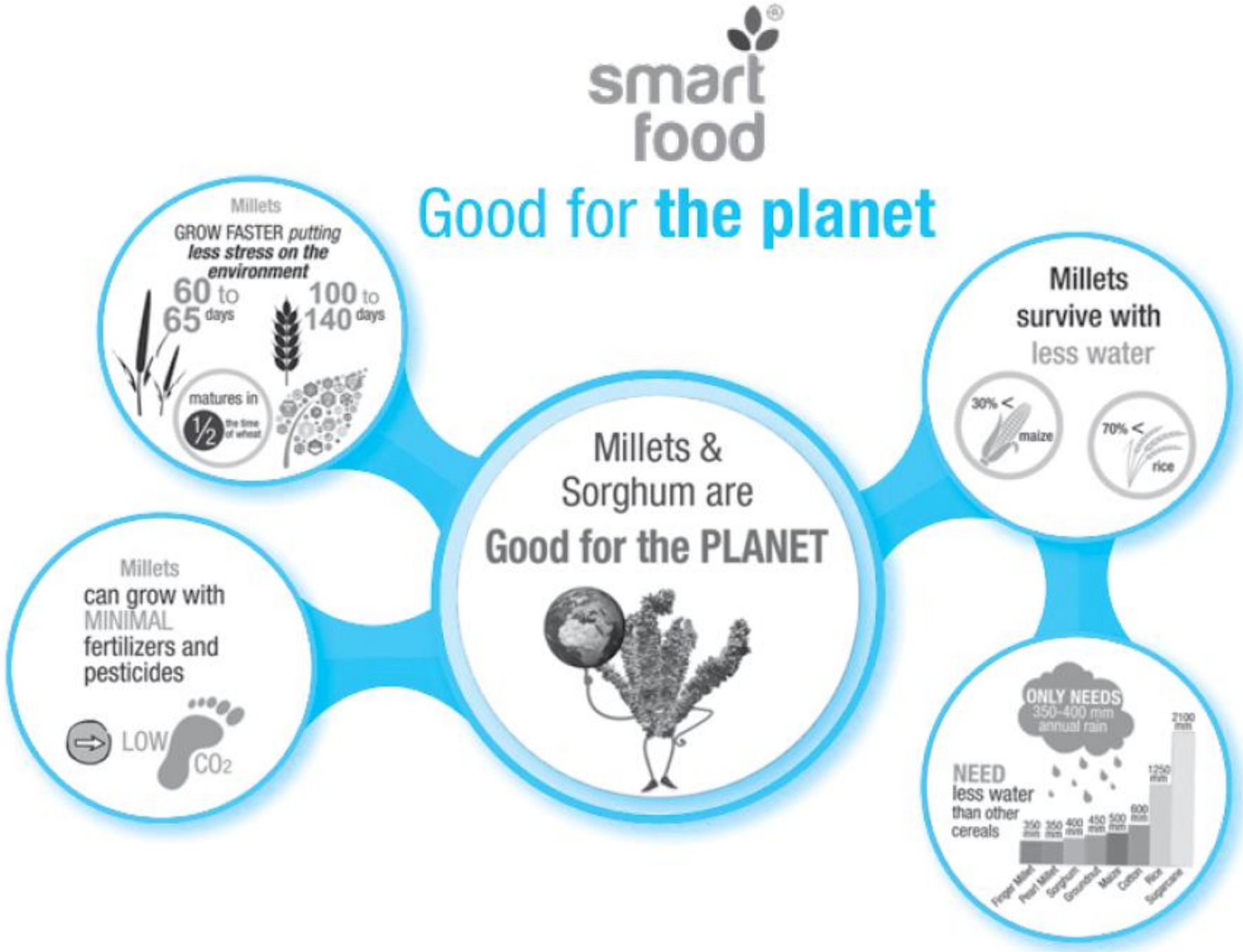
- ✓ Highly nutrition
- ✓ Revitalizing bone health
- ✓ Providing essential amino acids an affordable and effective protein source
- ✓ Helping to control diabetes
- ✓ Helping combat anemia

smart food

Good for **you**

Millets/Noble Grains/Nutri-Cereals????

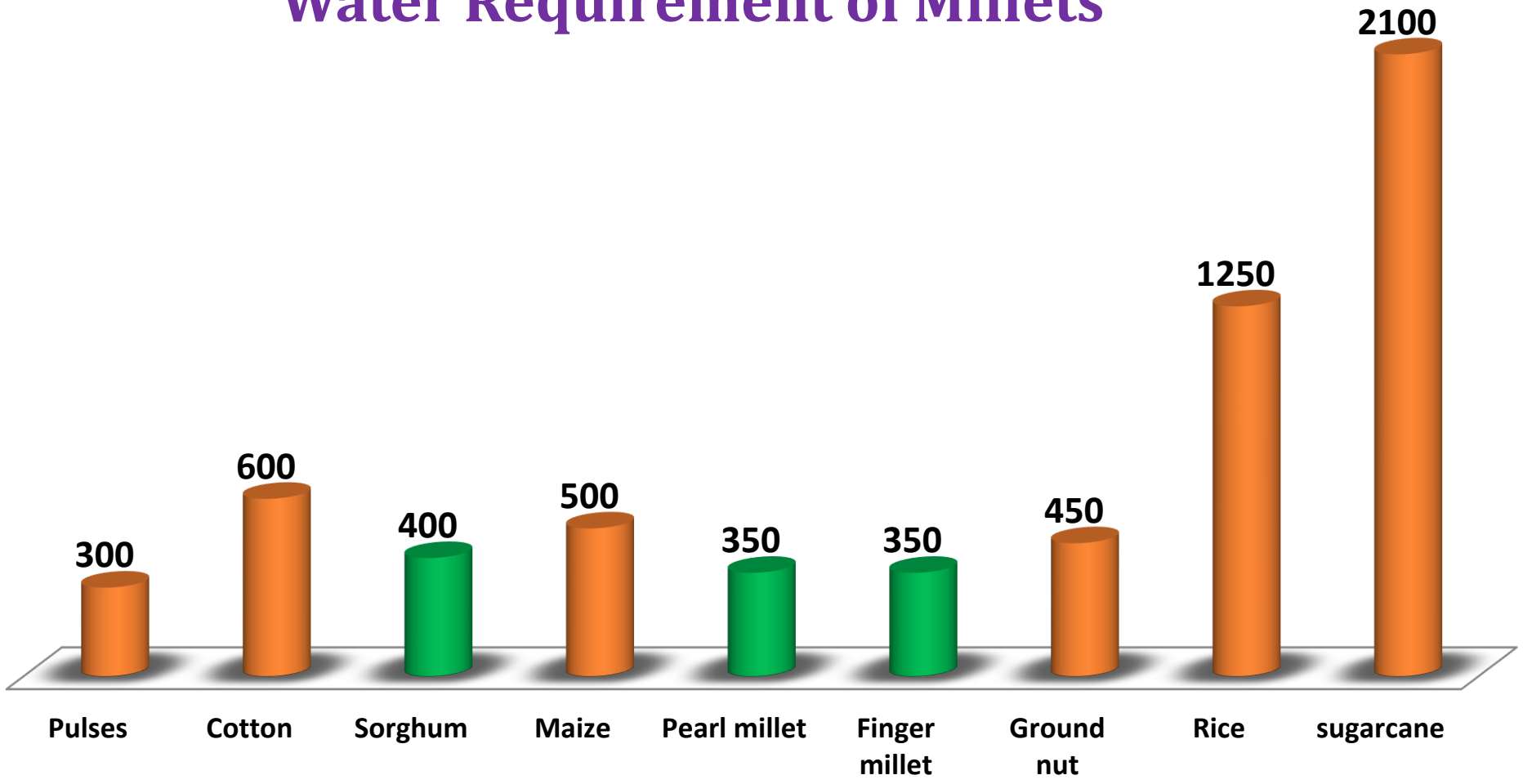
- Nutricereals- rich in minerals & vitamins, dietary fiber and antioxidant
- Offers as functional food & neutraceutical source
- Are gluten-free – so good for celiac patients
- Good oil-absorbing capacity
- Good gelling properties
- Slightly sweet nutlike flavor



Water requirement

Cane- 2100 mm
Rice- 1250 mm
Cotton- 600 mm
Maize-500 mm
Groundnut-450 mm
Sorghum-400 mm
Bajra- 350 mm
Ragi-350 mm

Water Requirement of Millets



Water requirement of millets & other crops (in mm)

Source: ICAR-IIWM, 2020

In the climate change scenario
Millets will be “harbingers of ever green revolution”

- **Since they are Versatile: highly adaptable- Climate change compliance**
- **Can withstand vagaries of weather and produce high biomass**
- **They are C4 crops – that have higher efficiency in absorbing and utilizing carbon dioxide**

Sorghum
(*Sorghum bicolor*)

Pearl Millet
(*Pennisetum glaucum*)

FINGER MILLET
(*Eleusinecoracana)*

FOXTAIL MILLET
(Setariaitalica)

KODO MILLET
(PaspalumScrobiculatum)

LITTLE MILLET
(Panicumsumatrense)

PROSO MILLET
(Panicummiliaceum)

BARNYARD MILLET
(Echinochloafrumentacea)

How Good for Globe?

Key Features

- ✓ Adaptation and mitigation strategy for climate change
- ✓ **Low carbon footprint**
- ✓ Survive in **high temperatures**
- ✓ Survive with **very little water**
- ✓ **Hardy and drought tolerant**
- ✓ Grow **faster**
- ✓ Smart Food crops require fewer farm inputs
- ✓ **Low water footprint**
- ✓ Nitrogen fixing and soil phosphorus release
- ✓ Soil microbe diversity

Suitable Example

smart food

Good for **the farmer**

Millets & Sorghum are Good for the FARMER

YIELD POTENTIAL 3x

Average rainfed sorghum yield is as low as 600 kg/ha, where as real potential is three times

New solutions needed
to feed 9 billion by 2050
A third of rice, maize, and wheat growing areas have experienced yield plateaus or decrease in yield in the last decade.

Multiple uses

FODDER & FEED

FOOD

BIOFUEL

BREWING

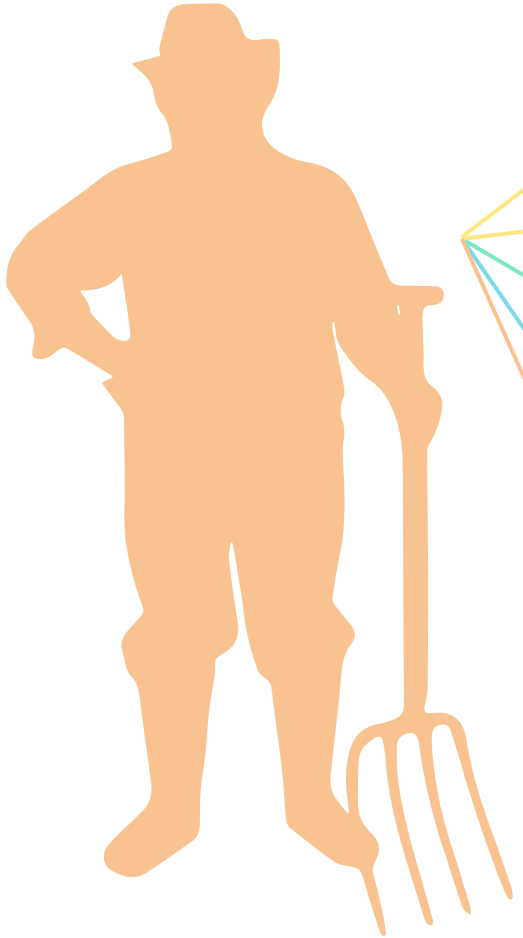
Especially if we can
DEVELOP THE VALUE CHAIN

Millets can SURVIVE IN DRY HOT CONDITIONS

Typically the LAST CROP STANDING in times of drought

CLIMATE CHANGE
- drylands become **hotter** and have more **droughts**
- millets more critical

How Good for Farmer?



- Fodder Security
- Nutritional Security
- Sustainability
- Remunerative Price
- Climate adaptation

MSP (Rs. Per Quintal) of Nutri - Cereals During 2018-19 to 2022-23

Year	Jowar		Bajra	Ragi
	Hybrid	Maldandi (Desi)		
2018-19	2430	2460	1950	2897
2019-20	2550	2570	2000	3150
2020-21	2620	2640	2150	3295
2021-22	2738	2758	2250	3377
2022-23	2970	2990	2350	3578

Source: CACP, 2023

Moving from the Big3 to Big5- Smart Food Approach

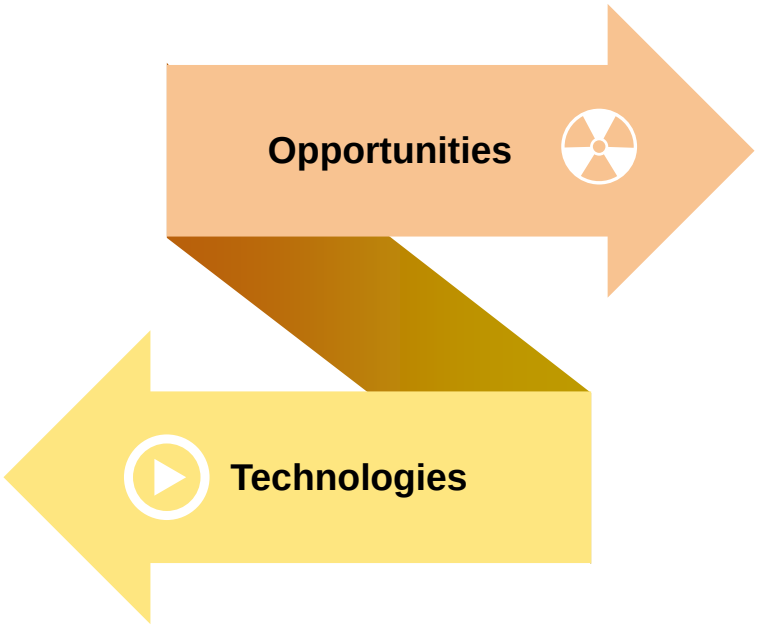
- With the **support of the Big3**, farmers have **had little incentive to grow alternative crops** that would be more suitable to their environment and the changing climate.
- This scenario is on the verge of changing, especially with the financial support
- The **central** and **state governments** to **revive millet cultivation**, **combined with the efforts of private industry**, **non-profits** and **governments** to **promote millet and sorghum with consumers and processors.**

Opportunities for Farmers

- Millets Seed Production
- Millets Farmers Producer Organizations (FPOs)
- Millets warehouse/Storage Creation and Trading
- Exploration of alternative uses of Millets
- Feed & Forage industry

Business Opportunities in Millets & Technology Transfer

Scientifically studied products



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- ✓ Millets Farmers Producer Organizations (FPOs)
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- ✓ Exploration of alternative uses of Millets
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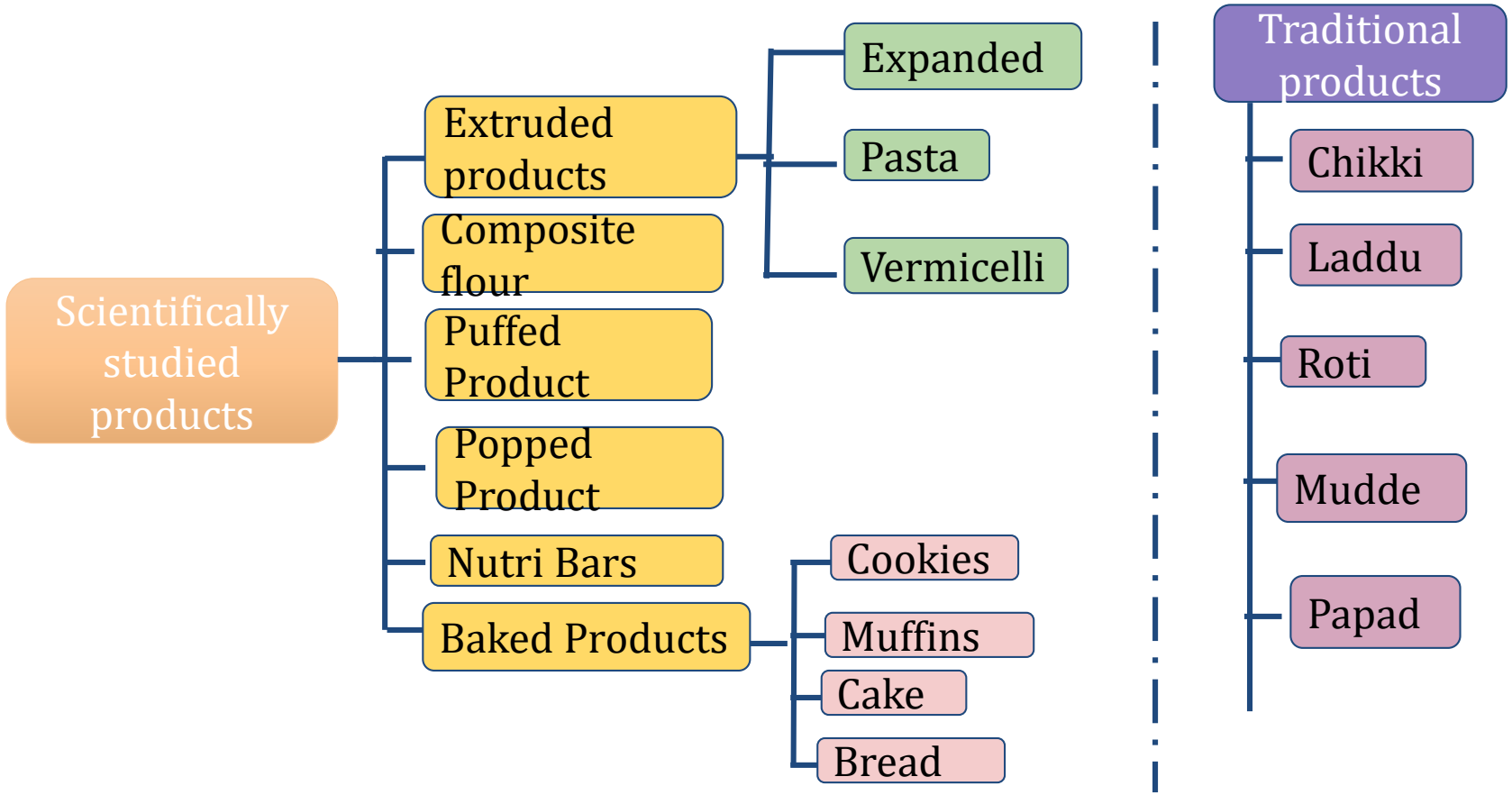
Millet based products



Sorghum Flour (Jowar Atta) **Sorghum Semolina – Three Variants**	➢ Sorghum Khichidi Rawa ➢ Sorghum Upma Rawa ➢ Sorghum Idli Rawa
Cold Extrusion Technology • Millet Vermicelli • Millet Pasta	**Advantages and Uniqueness of technology/Product** • Used to make *semiya* (sweet/spicy) and can be added to milk • It is rich in **protein, calcium, iron and magnesium** compared to wheat pasta • Finger, Bajra and Foxtail millet vermicelli/pasta can be stored for six months at ambient temperature.
Puffing Technology • Sorghum Puffs • Pearl millet puffs • Foxtail Puffs	• **Millet puffs are RTE** (ready-to-eat) snacks developed using a **puff gun machine** • Advantages and Uniqueness of technology/Product • They are rich in **protein and fiber** • Serve as an inflight snack or generic evening snack • The shelf life is for **2 months when packed in air-tight pouches at ambient temperatures.**
Bakery Technology • Millet Cookies • Millet Bread • Millet Cake	**Advantages and Uniqueness of technology/Product** • Utility as breakfast food • It is rich in **magnesium, zinc, iron, dietary fibre and protein.** • Shelf life: Millet biscuits - **6 months,** Millet Bread - **6 days** and Millet Cake has - **4 days** when packed in MET packets





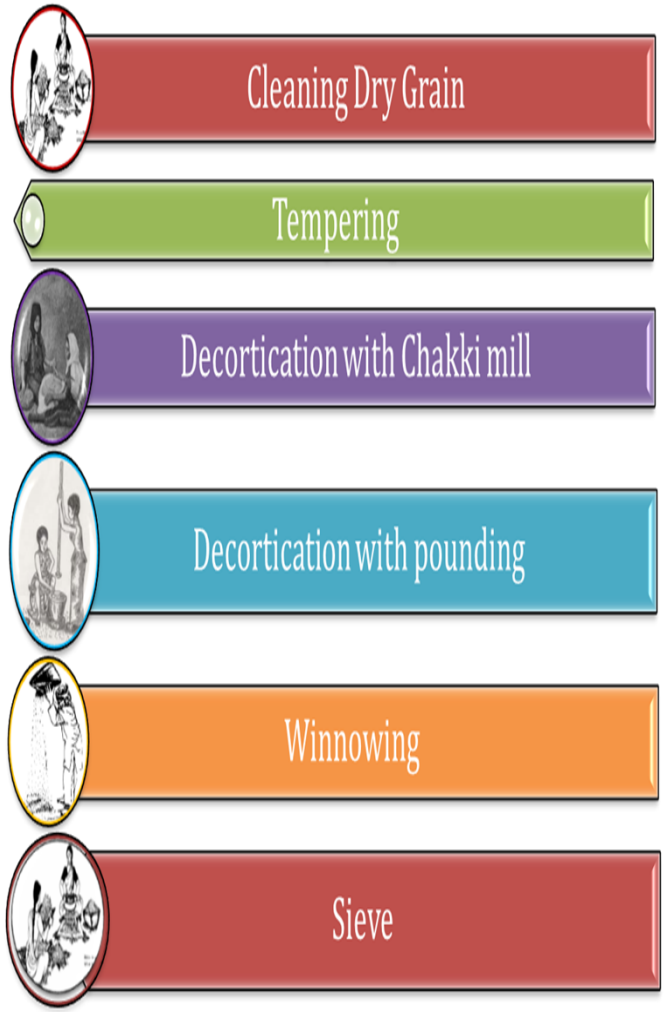









Available Primary Machineries on Small millets



Destoner cum Grader

Abrasive polisher for Kodo millet rice (AVM Machinery)

Rubber Roller Sheller

Ragi Pearler

Victor Model -Foxtail and Little Millet Dehuller

Source: AICRP, PHET, UAS Bangalore

STEPS TAKEN FOR PROMOTING MILLETS SINCE 2018

- ✓ **National Year for Millets 2018** - as Nutri cereals Sorghum (Jowar), Pearl Millet (Bajra), Finger Millet (Ragi/Mandua), Minor Millets i.e. Foxtail Millet (Kangani/Kakun), Proso Millet (Cheena), Kodo Millet (Kodo), Barnyard Millet (Sawa/Sanwa/ Jhangora), Little Millet (Kutki) and two Pseudo Millets (Buck-wheat (Kuttu) and Ameranthus (Chaulai).
- ✓ "Sub Mission on Millets" under National Food Security Mission since 2018.
- ✓ Several State launched mission on Millets.
- ✓ Millets included under POSHAN MISSION Abhiyan by Ministry of Women & Child Development.
- ✓ ICAR released one variety Quinoa (Him Shakti) .
- ✓ Quinoa – A new crop: ICAR has been referred to suggest for declaring Nutri-cereals.
- ✓ 200 Start-ups supported: (turnover of > Rs. 320 cr) through IIMR, Hyderabad.
- ✓ Technology backstopping for 400+ Entrepreneurs (turnover of >Rs 900 cr)
- ✓ 67 Value added Technologies developed at Centre of Excellences.
- ✓ Export of Millets increased from $ 24 million (2017) to $ 26 million (2020).
- ✓ Release of 13 High Yielding varieties including 4 bio-fortified varieties of millets.

The GoI proposed to United Nations **to declare 2023** as **International Year of Millets (IYOM).**

The proposal of India was supported by 72 countries and **United Nations General Assembly (UNGA)** declared **2023** as the **International Year of Millets on 5th March, 2021**.

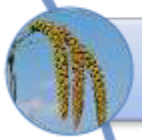
Now, GoI has decided to celebrate **IYOM,2023 to make it a people's movement** so that the **Indian millets, recipes, value-added products** are accepted globally.

Enhancement of Production & Productivity of Millets

1. **Strengthening quality seed chain :**
   I. Fully Support to Breeder Seed procurement
   II. Support Foundation and Certified Seeds
   III. **Encourage PPP mode**
   IV. **Seed Hubs**
2. **Frontline technology demonstrations/ cluster demonstrations.**
3. **Demand creation through awareness and increase in consumption.**
4. **Crop Diversification focus in favor of millets.**
5. **States to take steps for procurement**

SEVEN SUTRAs : THEMES
Govt. of India level launches

Enhancement of Production/ Productivity: **DA&FW & DARE**



Nutrition & Health benefits: **Health/FSSAI**

Value-addition, Processing & Recipe Development: **MOFPI& Tourism**

Entrepreneurship / Startup/Collective Development: **Commerce &DA&FW**

Awareness creation – Branding, Labelling & Promotion: **ALL**

International outreach : **Commerce and MEA**

Policy interventions for mainstreaming: **Dept of Food and PD and DA&FW**

National and International

Initiatives

by public and private sectors

Initiatives by Central and State Governments in India

Including Millets into key schemes

I. 2017- Millets and Jowar brought under MSP & PDS
II. 2019- MHRD, made jowar, pearl & finger millet into MDM

Initiative for Nutritional Security through Intensive Millets Promotion (INSIMP)

I. 2011-12- INSIMP under RKVY-National Agriculture Development Plan

Rainfed Area Development Programme (RAPD)

I. 2011- RAPD under RKVY

Accelerated Fodder Development Programme

I. 2011- under RKVY

Sub-Mission on Nutri-cereals under NFSM

I. Nutri-Cereal Status- 2018

2013- State Millet Missions

Initiative for Nutritional Security through Intensive Millets Promotion (INSIMP)

- **INSIMP** was launched in **2011–12** under **RKVY-National Agriculture Development Plan**
- It is the beginning of promoting millet cultivation and consumption for nutritional security in India.
- The program was aimed at supporting the states by providing **financial assistance for critical areas in the millet value chain** such as **seed production**, **installing processing units**, and **organizing awareness camps**.
- The scheme was implemented in **16 states**-Arunachal Pradesh, AP, CHS, GJ, HR, JK, KA, MP, MH, Odisha, RJ, TN, UP, UK, WB, and Sikkim.

The scheme also provided financial assistance to set up three National Centres of Excellence (CoEs) in 2011:

- Chaudhary Charan Singh Haryana Agricultural University (CCS HAU), Hissar for pearl millet
- Directorate of Sorghum Research, Hyderabad for sorghum
- **University of Agriculture Sciences, Bengaluru for finger millet and small millets**

Rain-fed Area Development Programme (RAPD)

RAPD is a scheme implemented in **2011** under RKVY with a budget outlay of INR 250 crore (35 million USD).

This scheme was aimed at **maximizing farmers' returns by increasing productivity** and **minimizing risks in rain-fed cultivation.**

The broad objectives of the scheme are:

a) Increasing agricultural productivity of rainfed areas in a sustainable manner

b) To **minimize the adverse impact of possible crop failure due to drought**, flood or uneven rainfall distribution through the diversified and composite farming system.

c) **Restoration of confidence** in rainfed agriculture by **creating sustained employment opportunities** through improved on-farm technologies and cultivation practices

d) **Enhancement of farmer's income and livelihood support** for the **reduction of poverty in rainfed areas**

e) Convergence of relevant developmental programs in the project area for optimal utilization of resources

Accelerated Fodder Development Programme

RKVY provided financial aid for the cultivation of forage varieties and dual-purpose varieties of sorghum and millet

Ex: **SSG 59-3** (Meethi Sudan), **Ruchira Maldandi,** **KMR 301** (MR 1 x GE 1409)

Nutri-farms Scheme for districts with high malnutrition

National Food Security Mission was launched in **2007-08**

Submission as **Nutri-farms Scheme** was launched in **2013–14** under NFSM with a budget of INR 200 crore

To promote the **cultivation of nutrient-rich food crops** in **100 high-burden malnutrition districts across 9 states.**

Pearl and finger millet cultivation was promoted as part of this program.

State Initiatives: Millet development

Odisha	• Odisha Millet Mission (OMM):2018, tag line farm to plate, reviving millets in 15 districts • Ragi included under PDS – 2018-19 (7 districts)
Karnataka	• Initiatives for Millets as "The Food of the Future" (incentive to farmers Rs. 10000/ha for cultivation of millets) • Organic farming & millet promotion "Savayava Bhagya Yojana". • Organized National and International trade fair.
Maharashtra	• Promoting Millets through Project on Climate Resilient Agriculture.
Telangana	• Raithu Bandhu Samithi, exclusive FPOs for millets.

Karnataka State Millet Mission- 2017-18

Karnataka: Millet capital of India

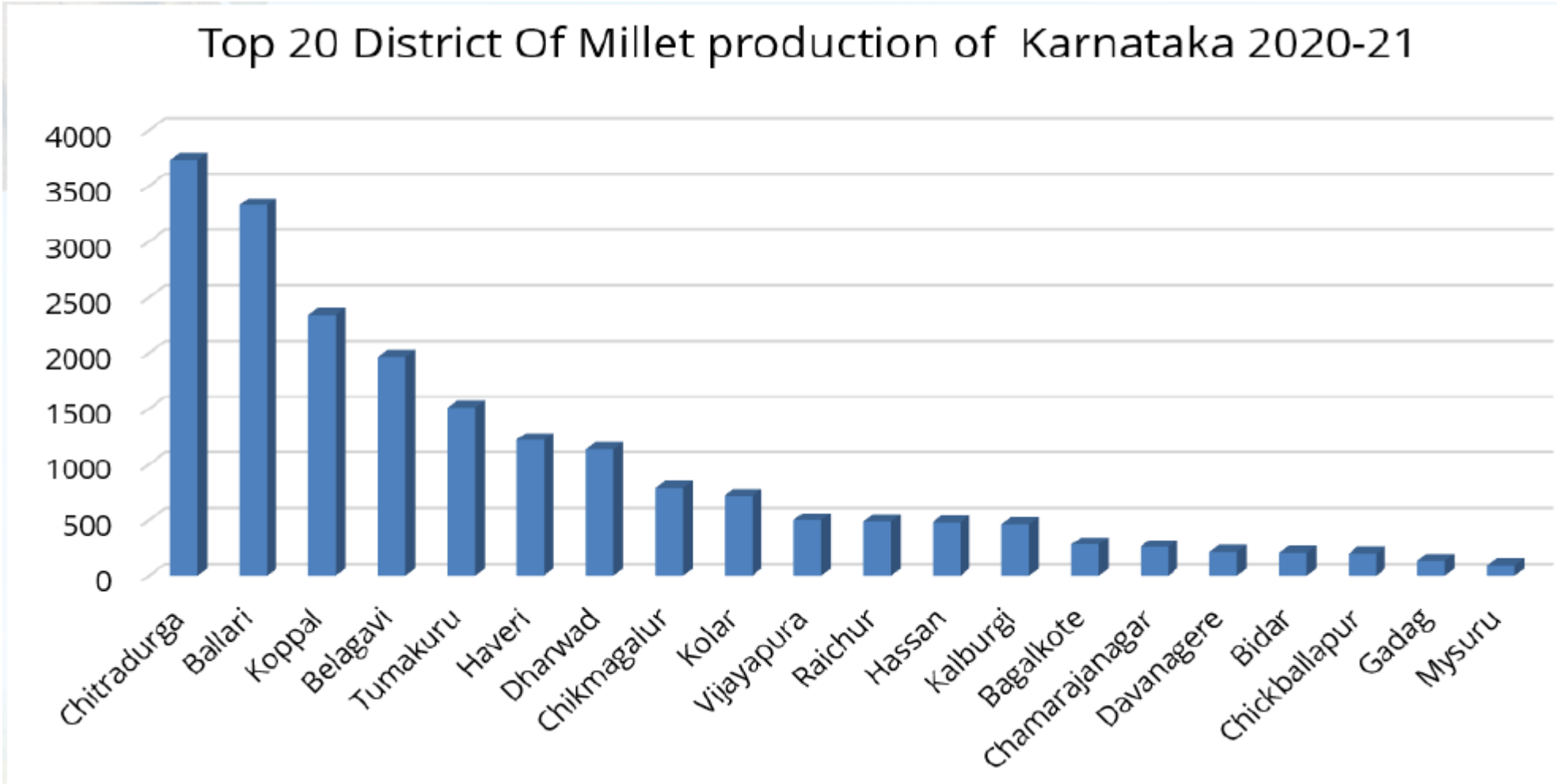
- Karnataka is promoting millets as **Nutri-cereals** that are **good to eat and grow and kind on the planet**.
- Under the Savayava Bhagya Yojane - **2013-14**
- Millet production and promotional programs are being taken up by the KSDA.
- The **perception of ragi** (finger millets) and **jowar** (sorghum), the **principal millets of the state**, as **food of the poor is changing mainly among those with lifestyle diseases.**

Area ('000) Acres
Ragi 6.73
Jowar 9.13
Pearl millet 3.28
Foxtail millet 3.70
Little millet 1.52

160 Unified Market Platform

Source: KSDA, 2022

- The state developed a brand called **"Siri"** for millets as they are referred as **'Siridhanya'** or rich grains.
- Karnataka has started implementing the distribution of millets through **PDS -where in the grains are sourced and distributed locally.**
- State is one of the leading **producers and consumers of millets** in the country.
- **GoK 'The Food of the Future'** through various initiatives and ensuring farmers get their due remuneration.
- It is procuring **Ragi & Jowar** by giving a bonus of **20-25 percent above the MSP from farmers**.



Source: Area figures are reconciled with Revenue Dept, Agriculture Dept and Water Resources Departments.

- Karnataka pioneer to undertake major innovative initiatives to develop the millet and sorghum value chains.
- In 2013–14, the government of Karnataka initiated millet procurement and distribution through the PDS.

- An International Organic and Millet Fair (Siridhanya Mela) by KSDA in April 2017.

- millet production, processing and consumption, including connecting farmers to markets through FPO.

- In 2018, the government introduced a competitive scheme **to support the incubation of SMEs in millets and sorghum**

- **5 Export Development Centre** in **Shivamogga**, **Hubballi – Dharwad,** **Ramanagara**, **Bidar** and **Mysuru**. Govt. of Karnataka

- MoUs with e-commerce players like **Amazon Global Selling and Flipkart to boost marketing of local products.**

Odisha Millet Mission

- The Government of Odisha- **2017**
- To Promote of Millets in tribal areas for 5 years
- A number of pilot projects are also underway to introduce millet-based diets in **Integrated Child Development Schemes (ICDS) and MDMs.**
- The programme focuses on inclusion of millets in the **state nutrition program, increase in household consumption**,
- Improved availability and productivity of millet seeds
- Strengthening of farmer cooperatives and Farmer Producer Organizations (FPOs) for better marketing.
- The programme has been implemented in **72 blocks in 14 districts of Odisha.**

https://milletsodisha.com/recipe/category/pearl https://milletsodisha.com/dashboard/mapdatadetails

The Indian Council of Agricultural Research (ICAR)–Indian Institute of Millet Research (IIMR)

- Working on whole value chain, supporting agribusinesses and promoting the value of millets and sorghum to consumers.
- Provide a range of new technologies on millet value-added foods for commercialization.
- Technologies for RTE and RTC millet products manufacturers.
- IIMR has established an incubator -**Nutri-Hub**

Sorghum millet-based flakes, cookies, extruded snacks, vermicelli, pasta, idli mix, multi-grain flour, etc.

Incubation Program

NEST

- **N**utri-Cereals **E**ntrepreneurship and **S**tartup **T**raining **Program**
- Nurture potential Agriprenuers, by providing training cum internship with other startups.
- Creates a pipeline of Agriprenuers

N-GRAIN

- **G**rowing and **R**ewarding **A**gripreneurship **I**n **N**utricereals Program
- Accelerate the small startups.
- Translation of minimum viable product to marketable & scale-up product and business

Training Program

STARTUP IGNITION

one day workshop on “Start-up Ignition - Entrepreneurial Opportunities in Millets Production, Processing & Value-Addition” for aspiring entrepreneurs

COOKING WITH MILLETS

Since millets do not have gluten (gelatinous character), the cooking with millets is not the same as wheat-based products. It requires some skill and training to make recipes with millets.

https://www.millets.res.in/m_recipes.php

https://www.millets.res.in/value-added-millet-products.php

Millet Vending Machine

Ready to Eat Products

Ready to Cook Products

installed in KrishiBhawan

CSIR-Central Food Technology Research Institute.

Giving Food a Future

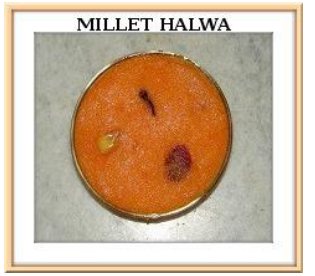
NPIC-CIF- Nutra-Phyto Incubation Centre & Common Instrumentation Facility

(A project initiated by CSIR-CFTRI, Mysore & KBITS, Govt. of Karnataka

Incubatess

- Salutary Nutryfoods R&D, Mysuru
- OxonEx, Bangalore
- Mycovation India, Bangalore
- Plantish Foods, Haryana
- Agromatic Nutryfoods Pvt Ltd, Bangalore

Ragi Rusk
Instant Beverage from Ragi
Instant Ragi Semolina/Porridge
Jowar Flakes
Malted Ragi Flour-Enzyme Rich
Millet based Upma & Halwa Mix
Multigrain Drink Mix
Shelf Stable Jowar Flour
Pedal Operated Millet Dehuller
Ragi Flakes
Ragi Murukku Mix
Ragi Pappad
Bread (Ragi & Bajra)
Cookies (Ragi & Bajra)
Expanded Bajra
Expanded Ragi
Germinated Ragi Drink Mix
Multigrain Pasta
Multigrain Sweet Mix (Halva)



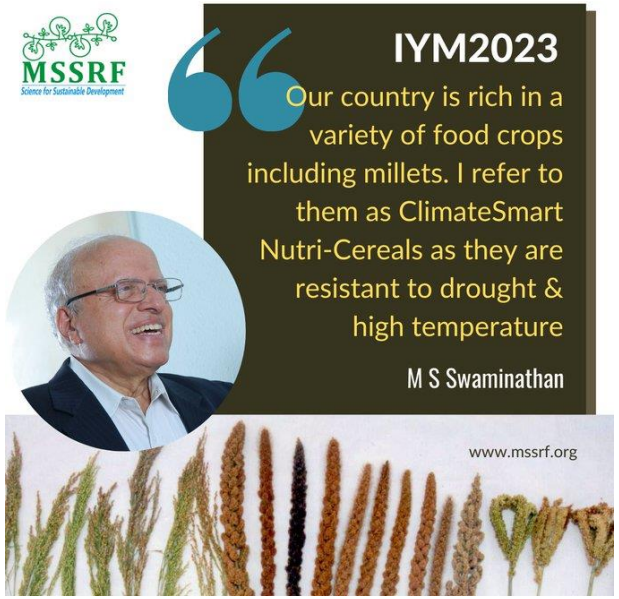
Non-profit Organizations

M S Swaminathan Research Foundation (MSSRF) **1988**

MSSRF M S Swaminathan Research Foundation
Science for Sustainable Development

Activities undertaken by MSSRF towards the millet

- Production of millet germplasm via community participation thereby stopping genetic erosion
- Processing of millets using organic farming methods
- Pricing of millets in programs like the school noon-meal program
- Enlarging the opportunities for Procurement both nationally and internationally



750 tribal farmers participated

Watershed Support Service and Activities Network (WASSAN)- 1996, Hyderabad

Comprehensive Revival of Millets program

This program was initiated in collaboration with the Department of Agriculture, Government of Andhra Pradesh in tribal and dryland areas. The program is taken up in 7 districts in AP with civil society partners on ground and WASSAN providing overall design and capacity-building support. Millets area in the program Blocks has revived to cover more than 5000 acres and several enterprises have come up.

Odisha Millets Mission

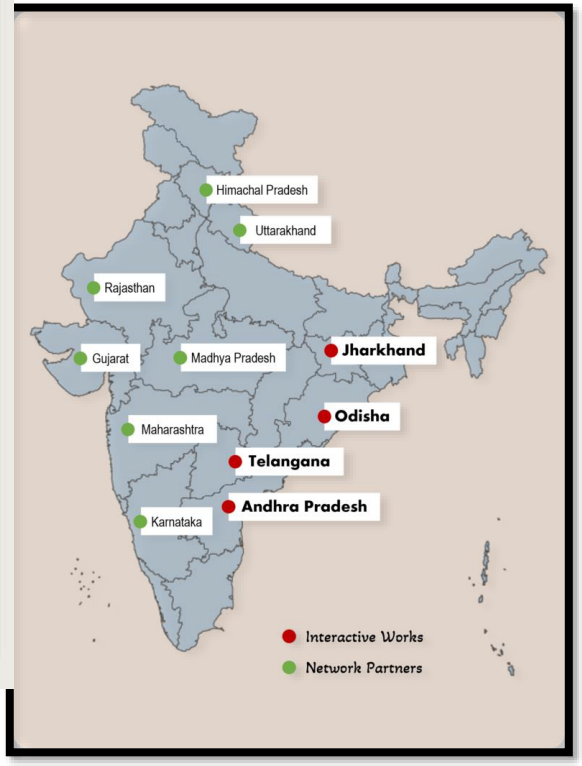
The program was taken up by the Government of Odisha with WASSAN playing critical support in developing the policy, design of the program and facilitating successful implementation on ground. The program has expanded to 81 Blocks in 14 districts with some Districts joining by converging District Mineral Fund. It has an outreach of over 100,000 millet farmers supported by 35 partner CSOs in the state.

Niti Aayog supported Pilot Initiative in 3 districts on Inclusion of Millets in iCDS

Niti Aayog came forward to take up a pilot program in Telangana state in 3 Aspirational districts (Asifabad, Mulugu and Bhadradri Kothagudem) to introduce millets into ICDS with FCI directed to procure millets and supply. WASSAN facilitates the program. The program has just started and is envisaged to promote millet production in those districts, processing and supply to the ICDS in due course.

Millets Processing

Millets processing was been a major stumbling block in increasing their consumption. Under the Sustain+ project WASSAN team adapted and standardised the technique of using household mixies for dehulling of minor millets. This is gaining acceptance as a micro-enterprise among a group of households to get their millets processed locally and in small quantities. Over 30 enterprises are now set up and modules on training the
local skilled person in assembling these modified mixies and attend to any repairs that have been completed. The mixies are removing a critical processing bottleneck in the tribal areas.



Deccan Development Society (DDS)-1983

- **DDS** is a grassroots organization working in about 75 villages with **Women's Sanghams** (voluntary village level associations for the poor) in **Medak District of Telangana.**
- The organization reaches out to approximately 5,000 women members representing some of the poorest in their respective communities.
- own exclusive FM Radio Station for wider publicity and awareness creation
- In the commercial centre of Medak district in the town of Zaheerabad is a **millet restaurant** called **CAFE ETHNIC.**
- An initiative to encourage the urban food consumers of Zaheerabad to adopt the millet and organic food culture.

Development of Humane Action (DHAN) Foundation- October 2, 1997, Madhurai TN

- **to enable the poor for Poverty Eradication, Water & Nutrition Security and Ecologically Balanced Development**

- DHAN Foundation has started working on mainstreaming small millets in the regular diets in a focused manner since 2011.
- 2011-14, **"Revalorising Small Millets in Rainfed Regions of South Asia (RESMISA)"**
- 2016-18, "Scaling up Small Millet Post-harvest and Nutritious Food Products Project"
- This Project aims at the revival of small millet and pulse-based cropping systems by **pursuing a multi-pronged research strategy to raise the profile of small millets.**

- Appropriate technologies & practices
- **Improvement in capacity of six equipment manufacturers**, 273 nano, micro and small food enterprises, 14 NGOs & 85 women/farmers' federations
- **Reach to >6,00,000 persons in 54 districts of 10 states**
- **On-site incubation model for equipment manufacturers**, and nano, micro and small food enterprises
- Partnership with research institutions (TNAU, McGill University & IIMR, ICAR), small millet value chain actors, 19 NGOs, Government departments in 10 Indian states and FACHIG Trust, Zimbabwe.

Private Sector Initiation

Farm-to-Fork restaurants, Millet Café & Caterers

- In India, farm-to-fork restaurants are gaining popularity.
- These restaurants with the **ideology of sourcing locally grown foods** and offering healthy and sustainable diets, **find sorghum and millets more attractive than current staples**.
- Restaurants such as **Paaka Organic Café** in **Hyderabad**, **GoNative** in **Bangalore**, **Annamaya in New Delhi** and **The Bombay Canteen** in **Mumbai** provide their customers with fine dining delicacies made from these traditional grains.
- Organic cafes are also coming up with variations of some of the commonly consumed food using millets.
- Rice-and wheat-based dish such as dosa, idli, khichdi, upma and roti are being made with different types of millet to provide healthier options for the consumers.

✓ **E-commerce platforms - https://www.organics-millets.in/index.php/Welcome/pages/23**

Breweries on millet

- In the North-eastern states, a millet brew, **chang**, is one of the traditional drinks.

- **Microbreweries are taking advantage of the increased interest in millet** and **sorghum** and are experimenting with recreating traditional beer and **crafting new varieties, including creating gluten-free beer.**

- **Great State Ale works** from **Pune**, **Biere Club** from **Bangalore** and **Toit Brewpub** from **Bangalore** are among the top brewers testing and perfecting millet brews.

International Efforts

Smart Food Initiative:

- The initiative is led globally by the largest agricultural research associations in Asia and Africa, ICRISAT, and the millet and sorghum activities within India undertaken in collaboration with ICAR-IIMR.

- In 2017, the Smart Food initiative was selected as one of the top global food innovations.

- Food Tank also listed the Smart Food initiative by ICRISAT as one of the 119 organizations up the food system in 2019.

- **Objective:** to mainstream selected Smart Foods (starting with millets and sorghum) as staples across Asia and Africa and to popularize them globally.

- To drive consumer demand to ensure that the whole value chain is developed and connected back to farmers.

Smart Food: An International Initiative

SF would contribute to (SDGs)

- Overcoming poverty and hunger (SDG 1 and 2),
- Responsible consumption and production (SDG 12),
- Adaptation to climate change (Goal 13).
- Gender equality (SDG 5) and
- Action through partnerships (SDG 17).

Vision

To envision a world where food is 'Smart' – healthy, sustainable on the environment and good for those who produce it.

Objectives

- The key objective of the Smart Food initiative is to diversify staples across Africa and Asia.
- By focusing on staples, which often constitute 70% of the plate and are eaten three times a day, Smart Food Initiative plans to have the biggest impact

millet-based mid-day meal experimental study

Smart Food Culinary Challenge for Students in India

Strategies involved in the Smart Food initiative

- Developing the Smart Food concept and messaging through **science-backed information, marketing strategies and materials**
- Creating a demand pull with consumers for Smart Food by undertaking **a viral campaign, ambassadors and influencing the influencers** with Smart Food;
- Facilitating engagement with the health, food service and media industries.
- Ensuring that **smallholder farmers and rural communities** in Asia and Africa benefit through a range of approaches
- Identifying and catalyzing **filling of knowledge gaps** and **scientific research needs** on SF

Impact of Steps taken since 2018

- **Production** has increased from **164 lakh ton in 2017-18, to 176 lakh tons in 2020-21**
- **Productivity** increased from **1163 kg/ha in 2017-18, to 1239 kg/ha in 2020-21**
- **Export of Millets** increased from **21.98 million US $ in 2017 to 24.73 million US $in 2020**
- Release of 154 high-yielding varieties, disease resistant, including **10 Nutri-Cereal crops and 9 biofortified varieties**
- **Increased availability of quality seed of new high-yielding** varieties and hybrids- 5780 qtls produced in 2020-21
- **Start-ups Supported:175 with a turnover of Rs. 250 crores**
- 400+ Entrepreneurs; hand-held: with a total estimated turnover of Rs. 1000 crore.
- **IIMR** provides **technical support to 14 states on State Millet's mission**
- **67 Value added Technologies developed**

Research Studies & Cases

Research study-1

Acceptance and Impact of Millet- Based Mid-Day Meal on the Nutritional Status of Adolescent School Going Children in a Peri Urban Region of Karnataka State in India

Seetha Anitha *et. al., 2021*

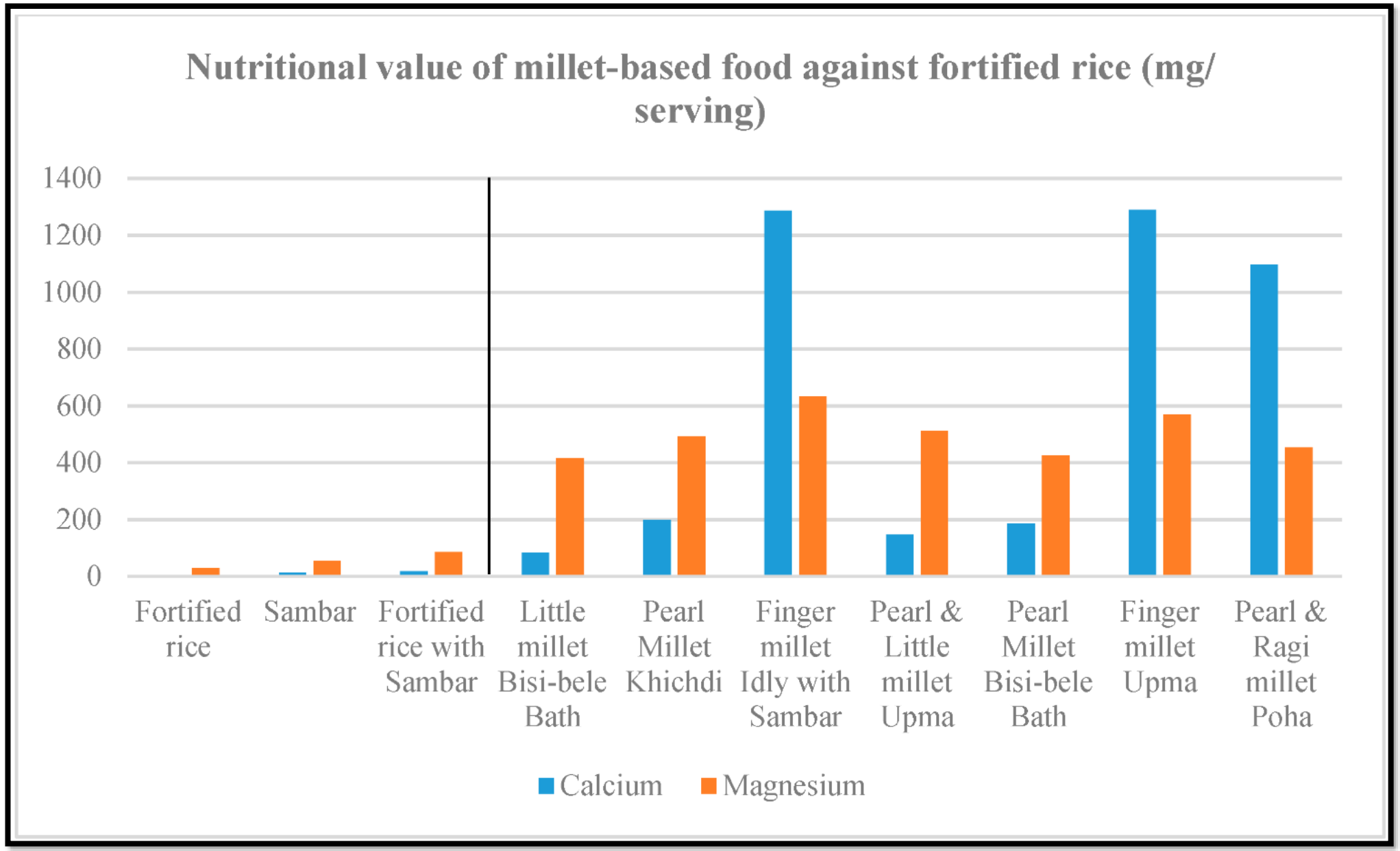
Methodology

- Selected Akshaya Patra beneficiary school children
- **Sample Size**: **400 children** (ages of 10 and 14) from 4 schools
- The study was conducted in four public schools in a **peri-urban region of Bengaluru**
- (Thathaguni, Kagallipura, Allahali and Chensandra villages), Karnataka state of India
- **200 from two schools as the control group**, and the other **200 from 2 schools as the intervention group**.

Table 1: Preference and acceptability of recipes based on sensory attributes

n=200

Name of the Recipe	Taste Mean (SD)	Appearance Mean (SD)	Smell Mean (SD)	Overall Acceptability Mean (SD)	Rank Based on Overall Acceptability
Little millet bisi belle bath	4.8 (0.6)	4.4 (0.8)	4.5 (0.9)	4.7 (0.7)	1
Pearl millet Kitchadi	4.5 (0.9)	4.3 (1.0)	4.4 (1.0)	4.5 (1.0)	5
Finger millet idli with Sambar	4.7 (0.8)	4.5 (0.9)	4.6 (0.7)	4.7 (0.8)	2
Little millet rice with Rasam	4.5 (1.1)	4.4 (0.9)	4.5 (0.9)	4.6 (0.9)	4
Upma	4.6 (0.9)	4.5 (0.8)	4.6 (0.8)	4.7 (0.8)	2


Nutritional value of millet-based food against fortified rice (mg/ serving)
1400
1200
1000
800
600
400
200
0
Fortified rice
Sambar
Fortified rice with Sambar
Little millet Bisi-bele Bath
Pearl Millet Khichdi
Finger millet Idly with Sambar
Pearl & Little millet Upma
Pearl Millet Bisi-bele Bath
Finger millet Upma
Pearl & Ragi millet Poha
Calcium
Magnesium

Research Study-2

Consumer survey about millets

Objective: to know about consumers' knowledge, perceptions, and consumption patterns, as well as the reasons for their practices and sources of information, on millets.

- This was conducted in August 2017

Methodology:

- random convenience sampling in shopping malls
- 15,522 people interviewed
- In 7 cities in 7 states of South, West, North, and East India: Ahmedabad, Bengaluru, Chennai, Delhi, Hyderabad, Kolkata, Mumbai
- 9,453 were women and 5,686 were men, with a wide age range

Results:

Largest reasons for consuming millets

1.‘I have a health problem’ (nearly 30% or people stating this)
2.‘I want to lose weight’ (15.1%)
3.‘I like the taste’ (about 14.6%)

The most commonly eatenforms of millets

1.ready to eat products (46%)
2.porridge consumed by (38%)

This represents an interest in modern convenient products as well as the easy to prepare traditional foods.

This reflects market opportunities for convenience products while also being culturally sensitive.

Research Study-3

Consumer Preferences for the Products of Minor Millets in Tumakuru District of Karnataka, India

Arjuman *et. al.*, 2022

Methodology

- The study was carried out in Tumakuru District of Karnataka, India during 2021-2022
- **Objective:** to examine the consumer preferences for the products of Minor millets.
- A total sample of 40 consumers comprising of 20 urban and 20 rural consumers.

Results:

Finger millet was the most consumed among the urban consumers with 3.5 kg per month followed by foxtail millet 2.5 kg per month and little millet 2.0 kg per month, while the urban consumers were equally consuming other millets.

On the other hand, rural consumers consume more quantity of finger millet i.e., 5.5 kg per month followed by foxtail millet 04 kg per month, while little millet also having demand and monthly average consumption of little millet among rural people is 03 kg per month.

Table 1: Consumption pattern of millet products among Urban and Rural consumers

Sl. No.	Millet Products	Urban consumers (n=20)			Rural consumers (n=20)		
		Numbers	Percent	Frequency of Consumption	Numbers	Percent	Frequency of Consumption
1	Millet Rice items	20	100.00	Daily	20	10.00	Daily
2	Malt	09	45.00	Weekly	08	40.00	Weekly
3	Upma	11	55.00	Weekly	13	65.00	Weekly
4	Idli/dosa	08	40.00	Weekly	07	35.00	Weekly
5	Sweets	05	25.00	Weekly	-	-	Weekly
6	Baked products	04	20.00	Occasionally	-	-	Weekly
7	Snacks	03	15.00	Occasionally	02	10.00	Occasionally

Table 2: Reasons influencing for the purchase of minor millets for consumption

Sl. No.	Particulars	Urban consumers (n=20)		Rural consumers (n=20)	
		Numbers	Percent	Numbers	Percent
1	Delicious taste	06	30.00	-	-
2	Nutritional and health conscious	19	95.00	13	65.00
3	Suggested by friends and relatives	05	25.00	-	-
4	Own production	-	-	16	80.00
5	Traditional staple food	-	-	18	90.00
6	Advice from doctors	11	55.00	-	-

Technical & Business Support by

M/s. Swaadika Health Staples Private Limited

Founder
Mr. V K Srinivasan

Address:
A 001 Garudadri Springs,
Nanjappa Layout,
JC Industrial Area,
Yelachenahalli,
Bangalore 560062

Mobile: 7349410305
Email: 4swaadika@gmail.com

Introduction:

Swaadika Health Staples is a food startup founded with the vision of adding health to every meal. It is quite arduous to meet the nutritional needs of each member of a typical healthy family. Lifestyle & workplace scenarios govern the choice of food consumed today. Now it becomes more complicated, if any member of a family has very specific nutritional needs due to certain medical conditions like DIABETES.

Though there is awareness of the depletion of nutrition in our foods, the options available are either inappropriate, inconvenient or do not appeal to the taste-buds.

Swaadika Health Staples Private Limited, Bangalore Registered in 2018. Started Operations in April 2019 The current list of Swaadika's Staples includes 8 RTC products made out of different combinations of small millets, thus providing health, taste, convenience and variety.

Our Online Presence: www.swaadika.in & https://www.merricart.in In talks with Big Basket, Qtrove &Jio

Online Grocery store in Mumbai

We have tied up with a chain of Diabetic clinic in Kerala and few centres in Bangalore.

For the FY 2019-20 a turnover of approximately 2lacs was registered. Now, we have stopped business operations as

the company is undergoing a restructuring, shifting of premises and procuring/renewal of licenses. We are likely to commence operations in 15days time

Future Plans:

- Convert the theme 1 Millet Meal A Day into a daily practice.
- By 2023-24, we expect to touch ~3 lac diabetic patients in Bangalore, Hyderabad and Chennai. We will capture 1.5% of the opportunity available in these geographies & a revenue of 11crores.
- We intend to consume ~ 400tons of millets procuring directly or indirectly.
- Provide employment to >45 people
- Generate a brand value of 50crores.
- In the long term (5-7 years) , we would like to target 0.1% Indian Diabetic market, of which would reach 8lacs diabetics and 33crores annual revenue.

Also, explore the options of establishing the idea of 1Millet Meal A Day, globally in 3 years

RSVP: Mr. V K Srinivasan

Email - 4swaadika@gmail.com

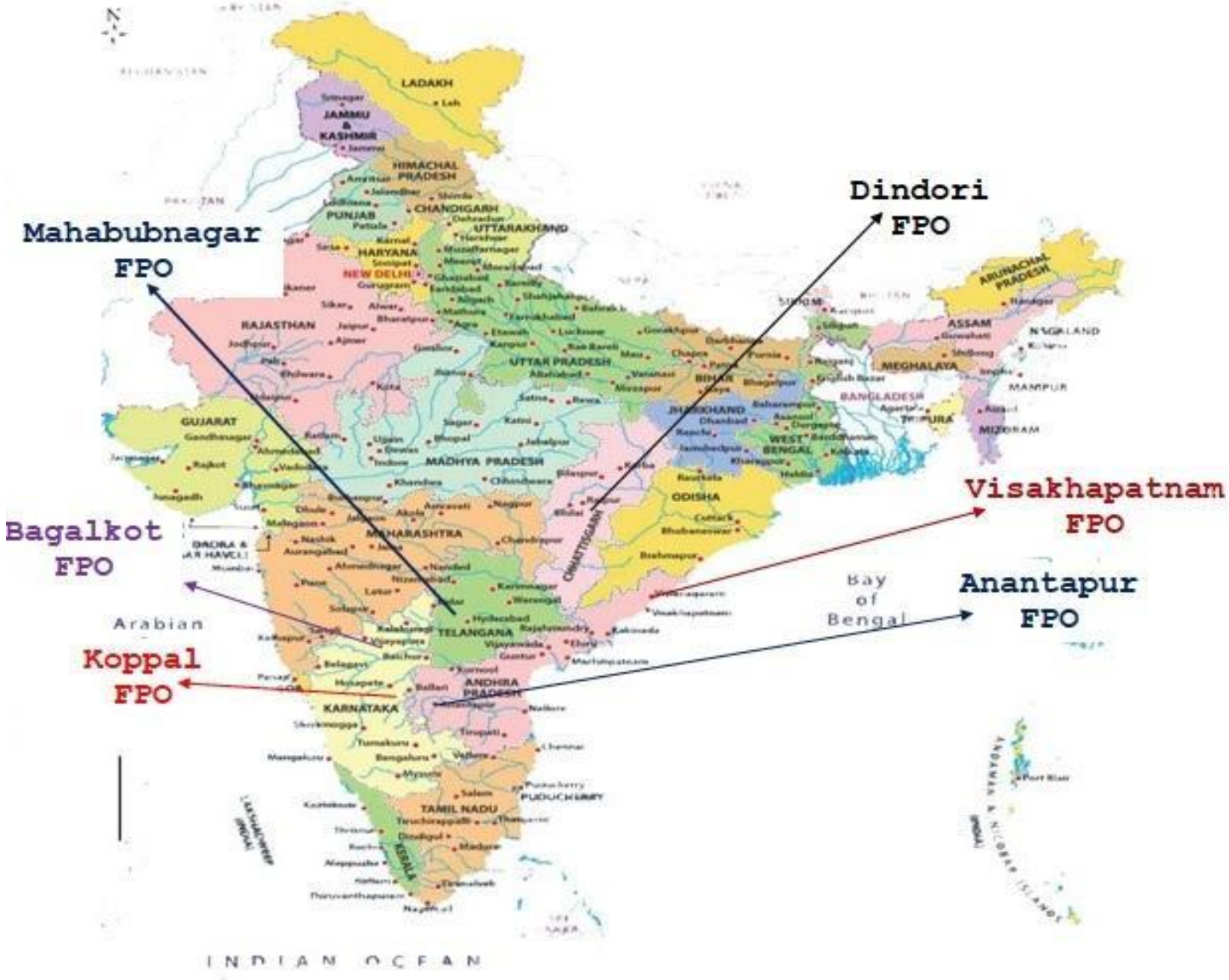
Conclusion

- Mainstreaming of SF into the **Food and nutritional security policies**, planning and implementation and **promote the production, marketing and consumption of Smart Food**
- Respond to hunger, malnutrition and climate change with crops that are both **climate-resilient** and **nutrient-rich**
- Need to raise awareness among the consumers
- Diversify both production and consumption ends of the food system
- Create the **market demand for Smart Food Production**
- Provides farmers with **economic incentives to grow Smart Food**

https://youtu.be/rKvrjTrTqPQ


Barnyard Millet
Little Millet
Foxtail Millet
Finger Millet
Kodo Millet
Pearl Millet
Jowar

THANK YOU


Mahabubnagar FPO
Dindori FPO
Visakhapatnam FPO
Bagalkot FPO
Anantapur FPO
Koppal FPO
LADAKH
JAMMU & KASHMIR
HIMACHAL PRADESH
PUNJAB
CHANDIGARH
UTTARAKHAND
HARYANA
NEW DELHI
RAJASTHAN
UTTAR PRADESH
BIHAR
JHARKHAND
WEST BENGAL
ODISHA
CHHATTISGARH
MADHYA PRADESH
GUJARAT
MAHARASHTRA
TELANGANA
ANDHRA PRADESH
KARNATAKA
TAMIL NADU
KERALA
PUDUCHERRY
ARUNACHAL PRADESH
ASSAM
MEGHALAYA
NAGALAND
MANIPUR
MIZORAM
TRIPURA
BANGLADESH
Arabian
Bay of Bengal
INDIAN OCEAN

Var	Pedigree	Year	Duration	Avg. Y/A	Org	Features
KMR 340	(OUAT-2 x WRT-4)	2016	90-95	35-40	UAS,B	White ragi variety, specially for Confectionary purpose, resistant to blast and blight diseases, tolerant to stem borer and aphids
KMR 204	GPU 26 x GE-1409	2012	100-105	30-35	UAS B	Early duration variety
KMR 301	MR 1 x GE 1409	2009	120-125	35-40	UAS B	Southern Dry zone of High grain and straw
GPU 48	GPU 26 x L 5	2005	95-100	30-35	PC Unit, UAS,B	Early, high yield, blast resistant Suitable for summer also
GPU 45	GPU 26 x L 5	2001	95-100	27-29	PC Unit UAS B	Early, blast resistant
L - 5	Malawi x Indaf 9	1999	120-125	35 -40	UAS B	Late variety, for early sowings
GPU 26	(I-5 x I-9) x IE 1012	2000	100-105	30-35	PC Unit, UAS, B	Early, blast tolerant, suitable late sowings & summer
Indaf 15	IE 67 x IE 927	1991	110 -115	35 -40	UAS B	Long duration/ Late maturity
Indaf 9	K1 x IE 98 0	1988	100 -105	30 -35	UAS B	For late sown conditions in Kharif

$$\text{Vulnerability (f)} = \frac{\text{Exposure (E) x Sensitivity (S)}}{\text{Adaptive Capacity (AC)}}$$

V E S AC

State	Overall Vulnerability Index Score	Rank
Assam	0.616	1
Andhra Pradesh	0.483	2
Maharashtra	0.478	3
Karnataka	0.465	4
Bihar	0.448	5
Manipur	0.424	6
Rajasthan	0.423	7
Arunachal Pradesh	0.408	8
Sikkim	0.370	9
Odisha	0.368	10
Nagaland	0.365	11
Tamil Nadu	0.339	12
Himachal Pradesh	0.329	13
Jammu & Kashmir	0.328	14
NCT Delhi	0.290	15
Gujarat	0.280	16
Uttar Pradesh	0.269	17
West Bengal	0.257	18
Tripura	0.250	19
Kerala	0.226	20

Council on Energy, Environment and Water (CEEW), 2021

Details of high burden malnutrition districts in selected states

Sl. No	State	No. of districts	Name of district
1	Assam	3	Golaghat, Karimganj, Nagaon,
2	Bihar	12	Buxar, Darbhanga, Jamui, Madhepura, Madhubani, Muzaffarpur, East Champaran, Purnia, Saharsa, Samastipur, Supaul, Sitamarhi
3	Chhattisgarh	03	Jashpur, Kawardha, Mahasamund
4	Jharkhand	01	West Singhbhum
5	M.P	25	Barwani, Chhindwara, Damoh, Datia, Dewas,Dindori, Guna, Hoshangabad, Jhabua, Katni, Mandsaur, Neemuch, Panna, Raisen, Rajgarh,Ratlam, Shajapur, Sheopur, Shivpuri, Sidhi, Tikamgarh, Ujjain, Umaria, Vidisha, West Nimar
6	Orissa	06	Baudh, Dhenkanal, Gajapati, Kalahandi, Koraput, Malkangiri
7	Rajasthan	16	Ajmer, Alwar,Baran, Barmer, Bikaner, Dausa, Dhaulpur, Dungarpur, Jaipur, Jhunjhunu, Karauli, Rajsamand, Sawai Madhopur, Sirohi, Tonk, Udaipur
8	Uttar Pradesh	32	Kanpur Dehat, Aligagriculturearh, Allahabad, JP Nagar, Auraiya, Azamgarh, Baghpat, Banda, Barabanki, Sant Ravidas Nagar, Bulandshahr, Chandauli, Chitrakoot, Etawah, Faizabad, Farrukhabad, Fatehpur, Ghazipur, Hardoi, Hathras, Kaushambi, Sant Kabir Nagar, Mainpuri, Moradabad, Muzaffarnagar, Siddharth Nagar, Kushinagar, Pilibhit, Rae Bareli, Rampur, Shahjahanpur, Unnao
9	Uttarakhand	02	Haridwar, Tehri Garhwal
Total		100	

Crop	Varieties	Special Features
Pearl Millet (Bajra)	ICTP-8203	70-80 days, Bold grain, early maturing composite, resistant to blast & Ergot disease & drought tolerant
	ICMV-221	Open-pollinated variety, High yielding compared to ICTP- 8203, Early maturing (75-80 days) and Resistant to Ergot & Downey mildew diseases.
Ragi	Indaf-5	High yielding variety, grown through out the year except winter months.
	Indaf-8 (Chetana)	Resistant to Drought & Blast disease, Y: 50 q/ha. (RF)
	Indaf-7	Moderately tillering, non pigmented, prolific cock's combing, 115-120 days, good cooking quality, Y: 45- 50 q/ha.
	Indaf-15	125-135 days, Grain colour brown, seed dormancy-1 and half months
	Indaf-9	Pre-monsoon variety, High vigour & resistant to cold conditions.
	MR-1	Pre-monsoon & Kharif Ragi, 120- 13 days, Tolerant to Drought, Y: 40 q/ha
	PU-28, GPU-26, 45, 48	Kharif & Summer resp. 110-115 days, Resistant to Neck blast & blight disease
Jowar	Maldandi (Desi)	