

IFAD-EU-CCAFS Project National Stakeholder Meeting

# Underutilized Crop Species for Resilient Agriculture, Food and Nutrition Security

## Role of Neglected and Under utilized Species (NUS) in nutrition and food security in India

**Dr. Saikat Datta Mazumdar**

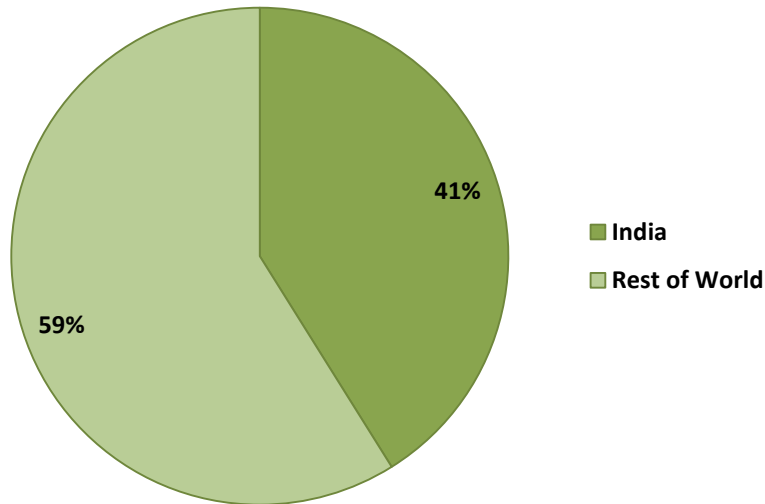
Chief Operating Officer  
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Agribusiness Innovation Platform



# Distribution Statistics of Malnutrition

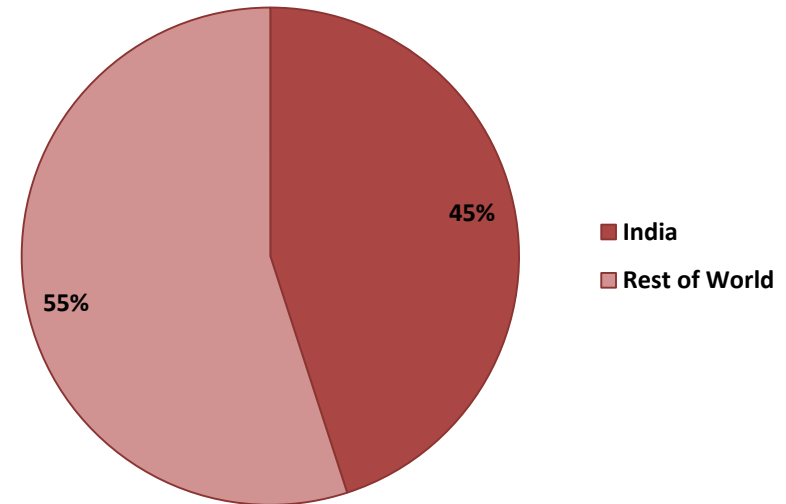
## Undernourished (%)

**India: 60 million**  
**Rest of World : 86 million**



## Severe Acute Malnutrition (%)

**India : 9 million**  
**Rest of World : 11 million**



## Malnutrition in India

- Estimated approx. **7 million children** under 3 years of age in India are **SAM** (weight for height < 3SD)\*
- **One-third** of currently **married women** in the age-group 15 – 49 years have **low BMI** (< 18.5 kg/m<sup>2</sup>)\*\*
- **47% girls** of 15 – 19 years have **low BMI**\*\*
- **51.2% women and 49.4% of children** aged 6 - 35 months in India are **Anemic**
- **19% of children** aged 12–35 months had received 3–5 doses of **Vitamin A**\*\*\*

Source: \*NFHS III,2005-06; \*\*Economic Survey of India; \*\*\*2014-15; DLHS III, 2007-08.

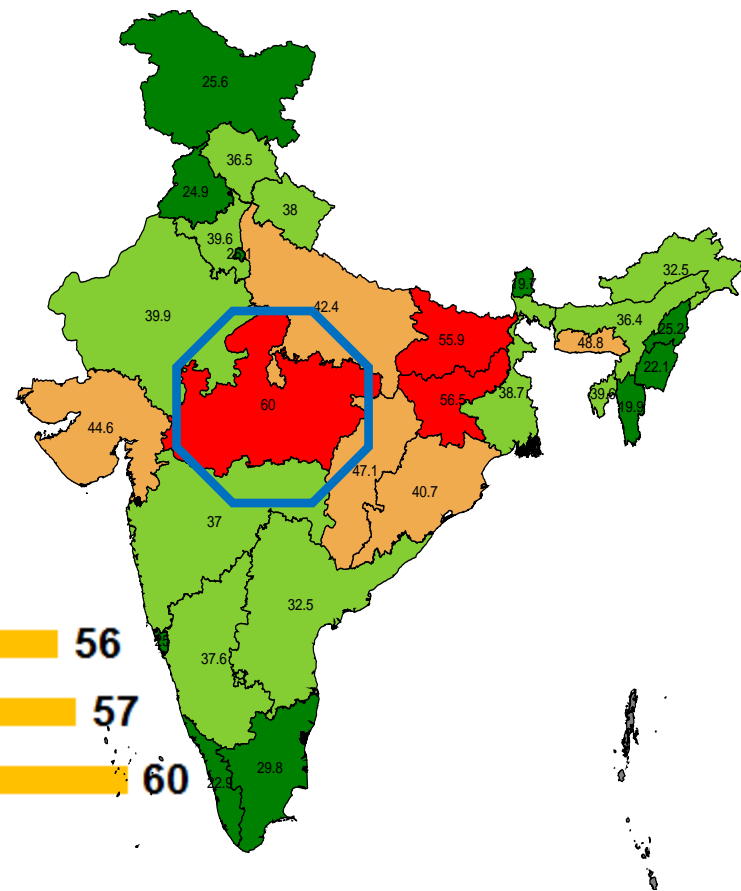
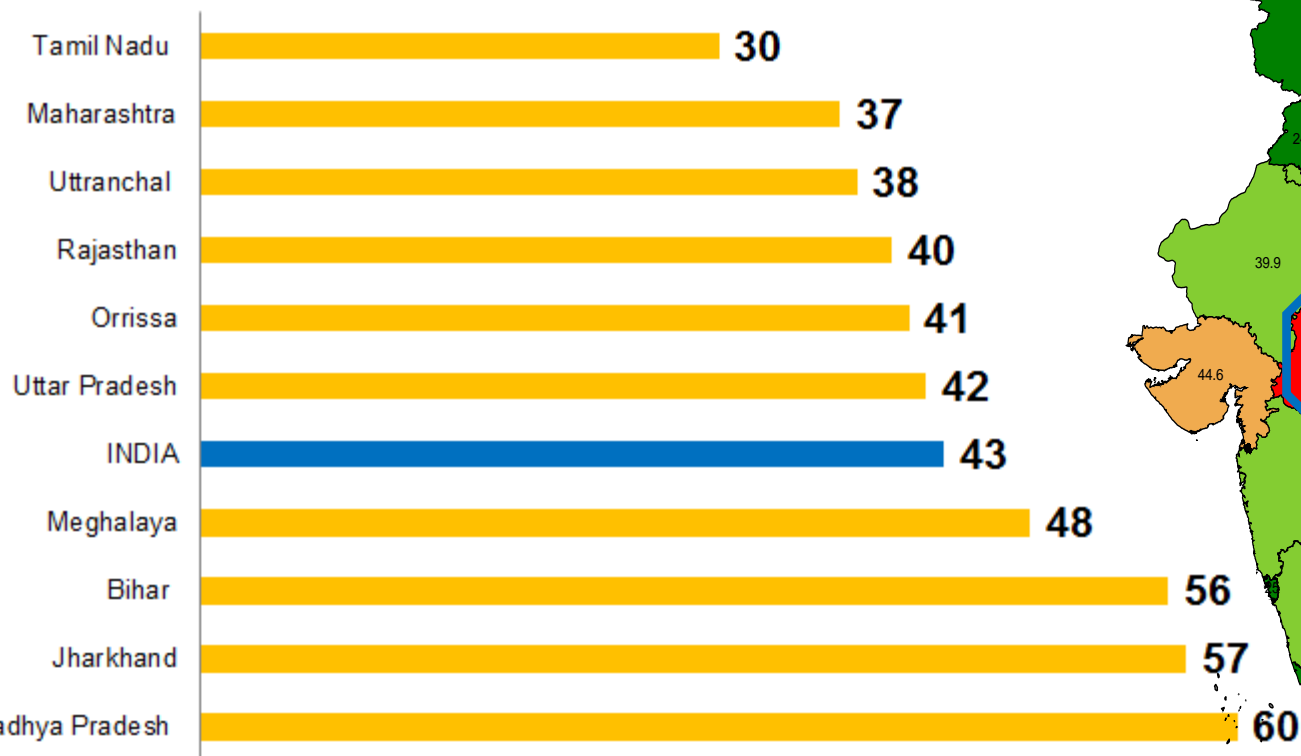
## Malnutrition in India ... contd

- Approx. **300,000 children below five years of age** are being killed every year by **diarrheal diseases**.
- **Lack of toilets** increase chance of infectious disease among children. 32% elementary schools in India either do not have toilets or toilets are dysfunctional.
- **Government's spending** on health and nutrition remain inadequate
  - out of pocket (OOP) expenditure on health stands as 58% in India of which more than 60% is on Medicine – WHO, 2012

Source: [http://www.who.int/nutrition/publications/severemalnutrition/9789241598163\\_eng.pdf](http://www.who.int/nutrition/publications/severemalnutrition/9789241598163_eng.pdf)

DISE 2013-14,

# Nutrition status of selected states of India



**60% Children (<5 Yrs) of MP are underweight.**

Source: National Family Health Survey-3, 2005 – 06

## Factors behind under nutrition

1. **Nutritional Status of Women** during adolescence, pre-conception and during pregnancy
2. **Poor** infant and young child feeding (**IYCF**) practices
3. **Poor intake** of essential calories, proteins, fats, and micronutrients
4. **Unsafe drinking water**, lack of sanitation and unhygienic environment



# Stunting, wasting and underweight- major cause of concern in India

Category	%	Number (in million)
<b>Stunting</b> - Malnourished children under 5 years of age below -3 SD according to “Height-for-Age index”	27.6	24.6
<b>Wasting</b> - Malnourished children under 5 years of age below -3 SD according to “Weight-for-Height index”	6.6	5.9
<b>Underweight</b> - Malnourished children under 5 years of age below -3 SD according to “Weight-for-Age index”	18.5	16.5

Source: NFHS – 3, India. 2005 – 06 and Census of India 2011



# Direct Nutrition Programs in India

- Integrated Child Development Services (ICDS) – <http://wcd.nic.in/icds/icds.aspx>
- National Nutrition Mission (NNM) - <http://wcd.nic.in/>
- Nutrition Education Scheme (FNB) - <http://wcd.nic.in/>
- Mid-day Meal (MDM) – <http://mdm.nic.in/>
- National Institute of Public Cooperation and Child Development (NIPCCD) – [www.nipccd.nic.in](http://www.nipccd.nic.in)
- Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG) – SABLA – <http://wcd.nic.in/schemes/sabla.htm>
- Interventions under National Rural Health Mission – <http://nrhm.gov.in/>
- Food Subsidy under Food Civil Supplies and consumer affairs department - <http://megfcsca.gov.in/>

Ref: FLAIR Working Paper – Nutrition Finance (Version 3), June 2015

Source: Expenditure Budget-Vol II, Union Budget of various years of following depTs (Web:<http://indiabudget.nic.in/vol2.asp>)  
i)Dept. of Agriculture and cooperation, Demand no-1; ii)Dept of WCD Demand no-108,iii) Dept of Food and Public Distribution, Demand no-18, iv) Min of Drinking Water and Sanitation, Demand no-30,v)Dept. of H&FW,Demand no-48,vi)Dept.of School Education and Literacy,Demand no-59,vii)Min.of Labour and Employment, demand no-62,viii)Dept.of Rural Development, Demand no-84



# Indirect Programs impacting FNS

- Schemes by Food and Civil Supplies Departments other than food subsidy
- Programs under Department of Agriculture
  - National Food Security Mission (NFSM)
  - Rashtriya Krishi Vikas Yojana (RKVY)
  - Price Stabilization fund for Cereals and Vegetables
  - NHM /Mission for Integrated Development of Horticulture
- Schemes under Department of Water Resources
  - National Rural Drinking Water Program
  - Nirmal Bharat Abhiyan (renamed as Swachh Bharat Abhiyan)
- Schemes under Department of Rural Development
  - National Rural Livelihood Mission
  - MNREGA

**Ref: FLAIR Working Paper – Nutrition Finance (Version 3), June 2015**

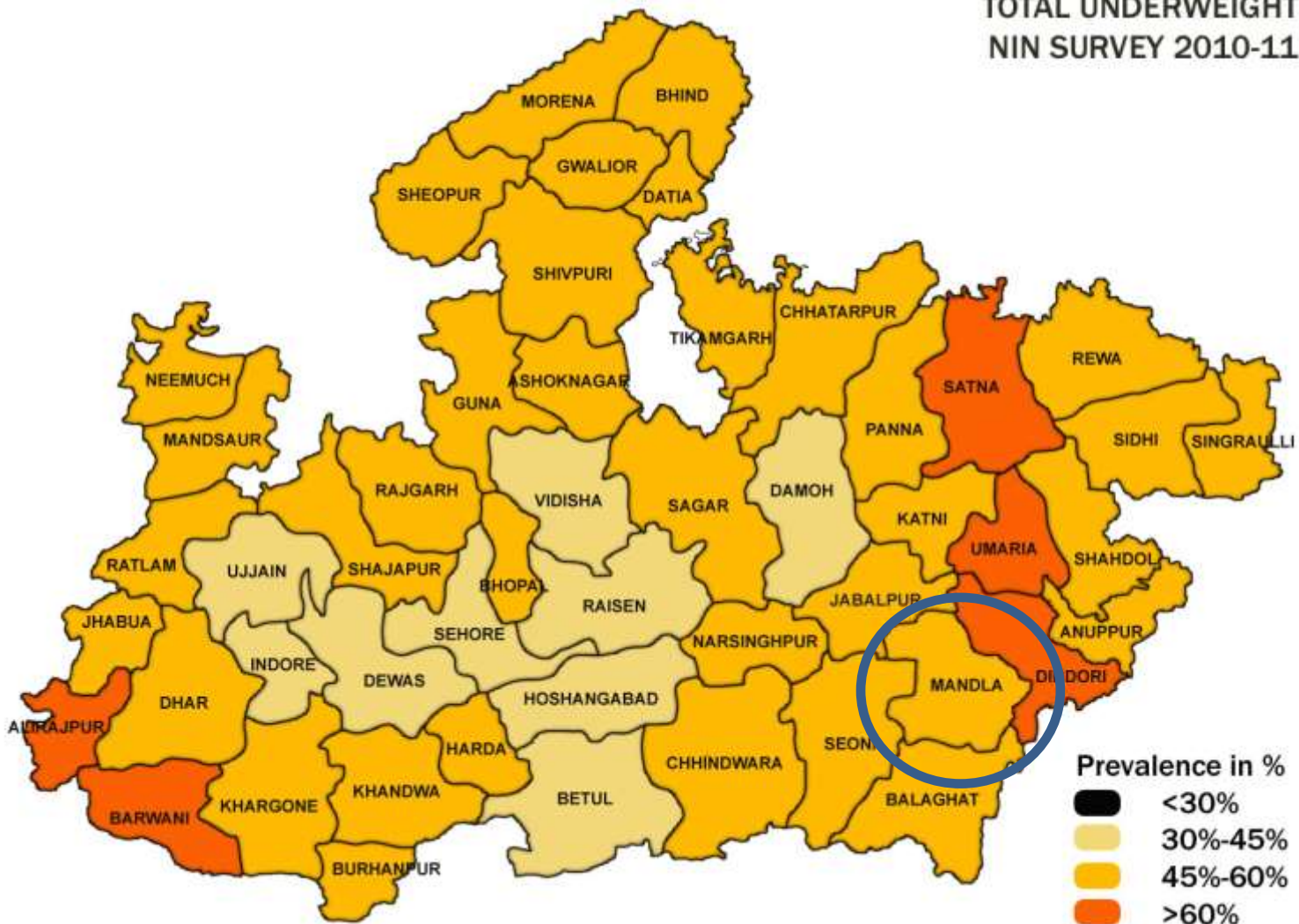
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i) Dept. of Agriculture and cooperation, Demand no-1; ii) Dept of Food and Public Distribution, Demand no-18, iii) Min of Drinking Water and Sanitation, Demand no-30, iv) Rural Development, Demand no-84



# MP data

TOTAL UNDERWEIGHT  
NIN SURVEY 2010-11

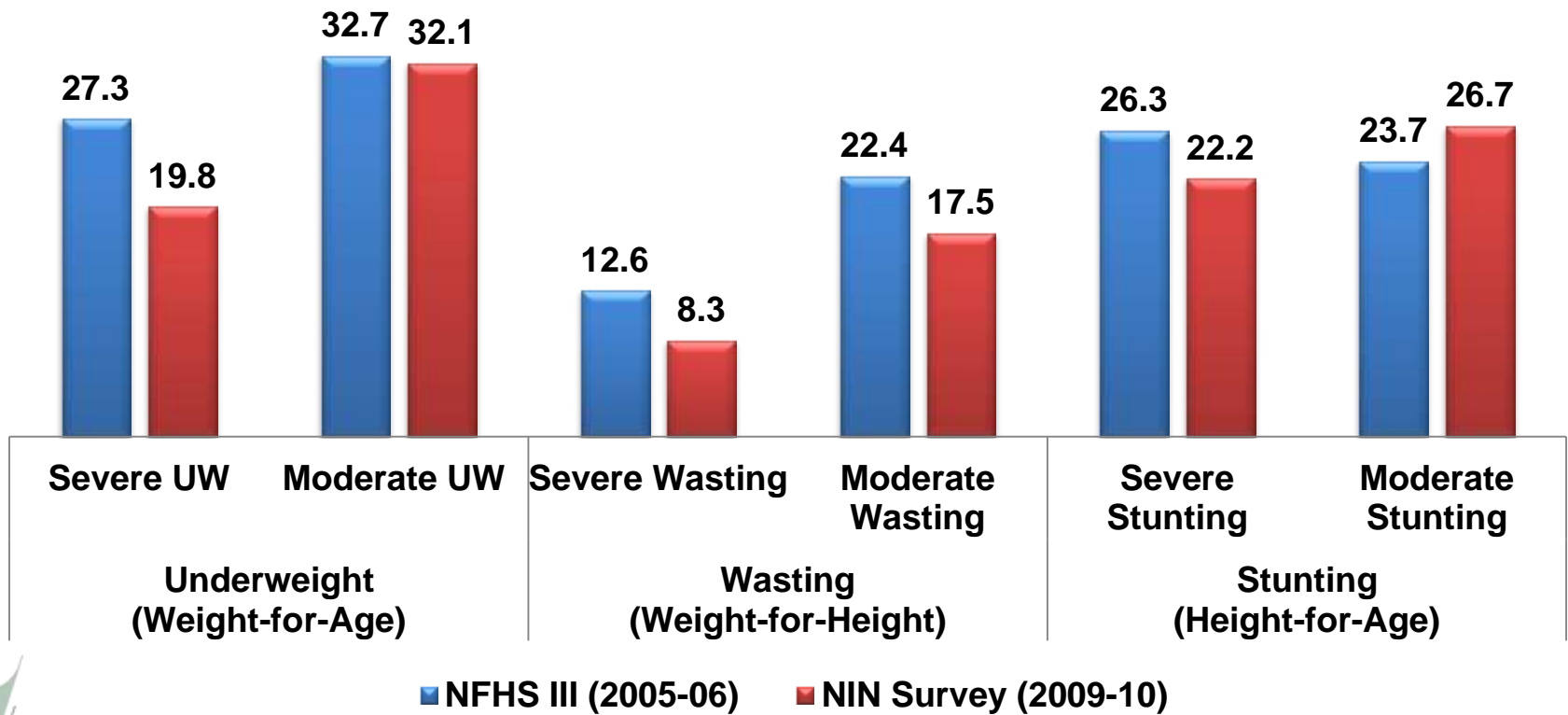


## MP data

Category	%	Number (in lakhs)	% of Indian statistics
<b>Stunting</b> - Malnourished children under 5 years of age below -3 SD according to "Height-for-Age index"	26.3	15.6	6.3
<b>Wasting</b> - Malnourished children under 5 years of age below -3 SD according to "Weight-for-Height index"	12.6	7.5	12.7
<b>Underweight</b> - Malnourished children under 5 years of age below -3 SD according to "Weight-for-Age index"	27.3	16.2	9.8

Source: NFHS – 3, India. 2005 – 06; Census of India 2011-12

# Nutritional status of below 5 years children (MP)



**WHO Growth Standards (2006):**

**MODERATE = Median  $<-2$  SD to  $\geq -3$  SD**

**SEVERE = Median  $<-3$  SD**

## MP data ... contd

- Only **40% of Children** (age 9 months and above) received at least one dose of **vitamin A supplement** (DLHS III)
- **43.1% of infants** of <6 months old were exclusively **breastfed** in the state (DLHS III)
- **23.4% babies** born have **low birthweight** (NFHS III)
- **Infant mortality rate** is as high as **67 per 1000 live births** in the state (NFHS III)
- Only **26% deliveries** in the state are **Institutional** (NFHS III)
- **40.3% children** of age 12-23 months received **all basic vaccines** (NFHS III)

Source: NFHS – 3, India. 2005 – 06; DLHS III, India 2007-08



# Food and Nutrition Programs in MP

National and MP State Programs on Food and Nutrition	
1	Integrated Child Development Scheme - National Program
2	Nutrition Meal Program in Schools - National Program
3	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (SABLA) - National Program
4	Food Subsidies by Department of Food and Civil Supplies, GoMP
5	Atal Bal Aarogya Evam Poshan Mission – MP state program

Source: Budget Publications, various years of following departments (Web: [www.finance.mp.gov.in](http://www.finance.mp.gov.in))

i) Dept. of Food, civil supplies and consumer protection, Demand no-39;

ii) Dept of WCD, Demand no-55

PAB minutes of Meetings , various years (Web: <http://mdm.nic.in/>)



# Food and Nutrition Programs in MP

## Nutrition and Health program under NRHM + RMNCH plus flexi-pool in MP

- 1 National Iron Plus Initiative- Dissemination, trainings, meetings etc.
- 2 Distribution of IFA syrups and tablets among children (6-60 months) and 5-10 years; Distribution of IFA tablets/Sucrose among pregnant and lactating women
- 3 Weekly Iron and Folic Acid Supplementation Program (WIFS)
- 4 Infant and Young Child Feeding/IYCF
- 5 Management of diarrhea & ARI & micronutrient malnutrition
- 6 Vitamin A solution for Addressing Micronutrient Malnutrition to improve the survival of child and reduction in U5MR
- 7 Care of Sick Children and Severe Malnutrition (e.g. NRCs, CDNCs etc.)
- 8 Micronutrient Supplementation Program ( cost of activities except cost of procurement of supplements)
- 9 National iodine deficiency disorder control program
- 10 Incentive for referral of SAM cases to NRC and follow up of discharge SAM children from NRCs/Community day care for SAM management



# Mandla district

## Demographic profile



<u>S. No</u>	<u>Indicator</u>	<u>Year</u>	<u>Mandla</u>	<u>Source</u>
1	Total House holds	2011	249,187	Census of India
1	Population	2011	10,53,522	Census of India
2	Male	2011	525495	Census of India
3	Female	2011	527028	Census of India
4	Rural	2011	923309	Census of India
5	Urban	2011	130213	Census of India
6	Growth Rate (%)	2011	17.8	Census of India
7	Child population (0-6 years)	2011	144799	Census of India
9	Child population (0-6 years) to total Population	2011	13.74%	Census of India



# Mandla district

## Children Nutritional Status

<u>S. No</u>	<u>Indicator</u>	<u>Year</u>	<u>Mandla</u>	<u>Source</u>
1	Children age 0-59 months underweight (%)	2010-11	56.5	NIN
2	Children age 0-59 months severe underweight (%)	2010-11	29.5	NIN
3	Children breastfed within one hour of birth (%)–Total	2007-08	56.8	District level House Hold Survey
4	Children age <6 months exclusively breastfed (%)– Total	2007-08	44.3	District level House Hold Survey
5	Children age 9-35 months who received Vitamin A in last 6 months (%)–Total	2007-08	55.9	District level House Hold Survey
6	Children age more than 21 months who received three doses of Vitamin A in last 6 months (%)–Total	2007-08	11.5	District level House Hold Survey
7	Children given ORS during diarrhea (%)	2007-08	33.0	District level House Hold Survey

# Mandla district

## Children Health Status

<u>S. No</u>	<u>Indicator</u>	<u>Year</u>	<u>Mandla</u>	<u>Source</u>		
1	Infant mortality rate	Total	Total	2010-11	71	Annual Health Survey
			Male	2010-11	67	Annual Health Survey
			Female	2010-11	75	Annual Health Survey
		Rural	Total	2010-11	74	Annual Health Survey
			Male	2010-11	68	Annual Health Survey
			Female	2010-11	79	Annual Health Survey
		Urban	Total	2010-11	-	Annual Health Survey
			Male	2010-11	-	Annual Health Survey
			Female	2010-11	-	Annual Health Survey
2	Under 5 mortality Rate	Total	Total	2010-11	89	Annual Health Survey
			Male	2010-11	88	Annual Health Survey
			Female	2010-11	91	Annual Health Survey
		Rural	Total	2010-11	93	Annual Health Survey
			Male	2010-11	90	Annual Health Survey
			Female	2010-11	97	Annual Health Survey
		Urban	Total	2010-11	-	Annual Health Survey
			Male	2010-11	-	Annual Health Survey
			Female	2010-11	-	Annual Health Survey
3	Neo-Natal Mortality Rate	Total	2010-11	48	Annual Health Survey	
		Rural	2010-11	50	Annual Health Survey	
		Urban	2010-11	-	Annual Health Survey	
4	Post Neo-Natal Mortality Rate	Total	2010-11	23	Annual Health Survey	
		Rural	2010-11	24	Annual Health Survey	
		Urban	2010-11	-	Annual Health Survey	
7	Children age 12-23 months receiving BCG vaccine (%)– Total	2007-08	85.2	District house hold survey		
8	Children age 12-23 months receiving DPT 3 vaccine (%)– Total	2007-08	47.2	District house hold survey		
9	Children age 12-23 months receiving Polio 3 (%)– Total	2007-08	54.3	District house hold survey		
10	Children age 12-23 months receiving measles vaccine (%)– Total	2007-08	69.3	District house hold survey		
11	Children age 12-23 months receiving full immunization (%)– Total	2007-08	30.5	District house hold survey		





Out of the 7,000 food crops that we know of in the world, 50% of our plant-derived calories come from **just 3 species** - Rice, Maize and Wheat.

It is often stated, that only 30 crops “feed the world”. These are the crops which provide 95% of dietary energy (calories) or protein.

Source: <http://www.biodiversityinternational.org/research-portfolio/marketing-diversity/neglected-and-underutilized-species/>



# What are NUS?

Those non-commodity crops, which are part of a larger biodiversity portfolio, once more popular and today neglected by users' groups for a variety of agronomic, genetic, economic, social and cultural factors. These are:

- important in local consumption and production systems
- highly adapted to agro-ecological niches and marginal areas
- ignored by policy makers and excluded from research and development agendas
- represented by ecotypes or landraces
- cultivated and utilized drawing on indigenous knowledge
- hardly represented in ex situ gene banks
- characterized by fragile or non-existent seed supply systems

Ref: <http://www.agriculturesnetwork.org/magazines/global/valuing-crop-diversity/underutilized-plant-species-what-are-they>





# NUS examples – India

**Millets:** Minor (small) millets

**Pulses:** *Dolichos uniflorus*, *Psophocarpus tetragonolobus*, *Vigna aconitifolia*, *V. umbellata*

**Oilseeds:** *Amoora rohituka*, *Azadirachta indica*, *Aesandra butyracea*, *Calophyllum inophyllum*

**Vegetable crops:** *Amaranthus polygonoides*, *Bambusa tulda*, *B. spinosa*, *B. Vulgaris*.

**Fruit crops:** *Aegle marmelos*, *Artocarpus lakoocha*, *Carissa congesta*, *Emblica officinallis*.

**Spices, condiments and beverage plants:** *Amomum aromaticum*, *A. xanthioides*, *Anethum sowa*, *Areca triandra*.

**Fodder and fodder-cum-fuel species:** *Agrostis alba*, *Albizia lebbek*, *Desmodium parvifolium*

**Gum, wax and resin plants:** *Acacia senegal*, *A. nilotica*, *Butea monosperma*, *Commiphora wightii*, *Prosopis juliflora*.

# Crops of Madhya Pradesh

## Major Crops:

- Wheat
- Rice
- Corn
- Jowar
- Gram
- Pigeon pea
- Soybean
- Groundnut
- Cotton
- Sugarcane

## NUS:

- Minor (small) millets
- *Citrullus colocynthis*
- *Ficus cutulata*
- *Cassia tora*
- *Cassia hirsuta*

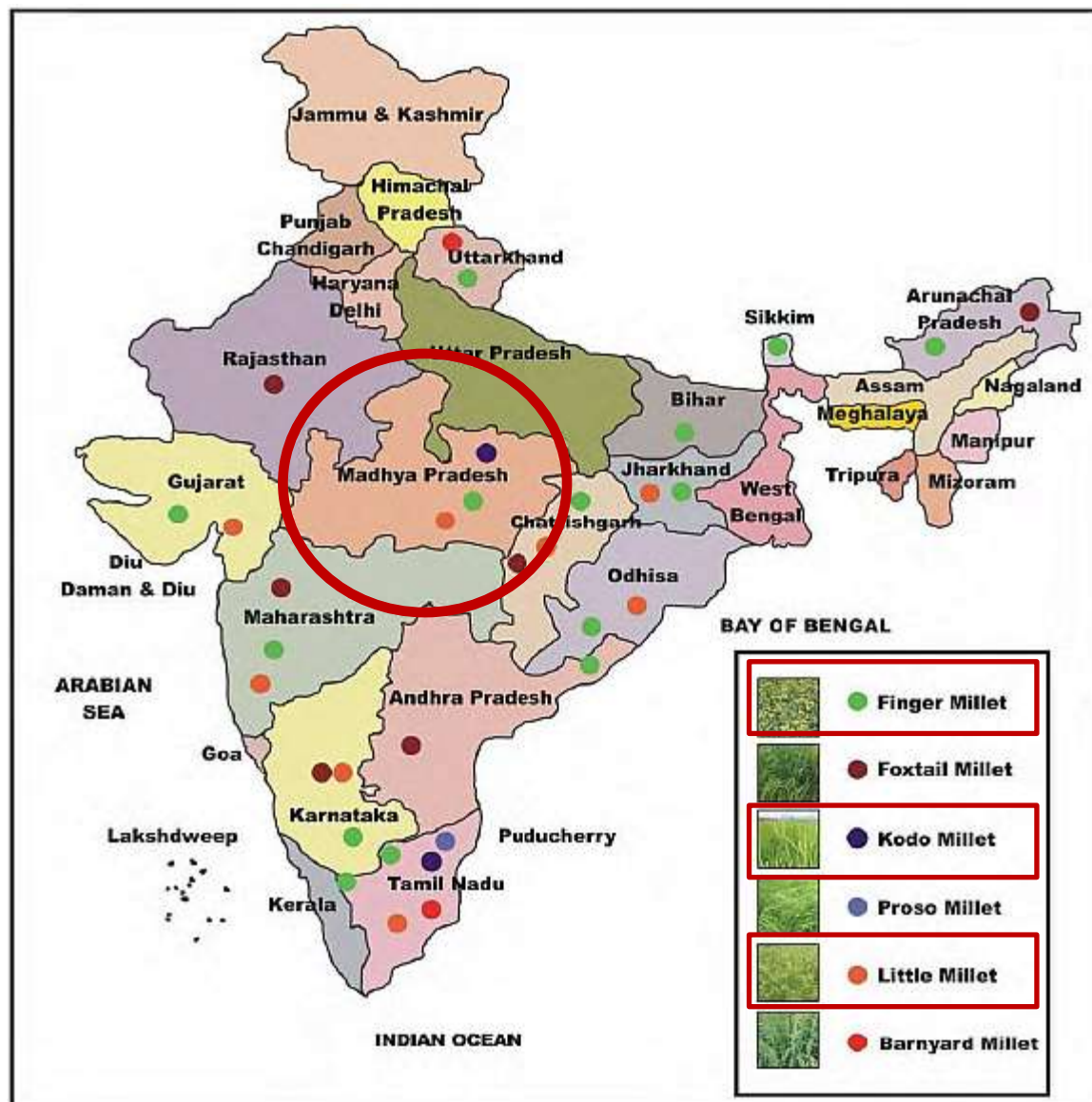


# Small Millets

- **Crops of antiquity**-traditional cropping systems
- **Ethnic foods & diversity**
- **Suitable for dry lands & important in hill and tribal agriculture**
- **Food & Fodder security** of disadvantaged regions
- **Require less water**, mature early and cultivated in scarcity conditions
- **Highly Resilient** in adapting to different ecological conditions
- **Ideal crops for climate change** and contingency plantings
- **Unique nutritional properties**  
high fiber, quality protein, mineral composition, Nutraceuticals
- **Nutritional security of disadvantaged groups.**

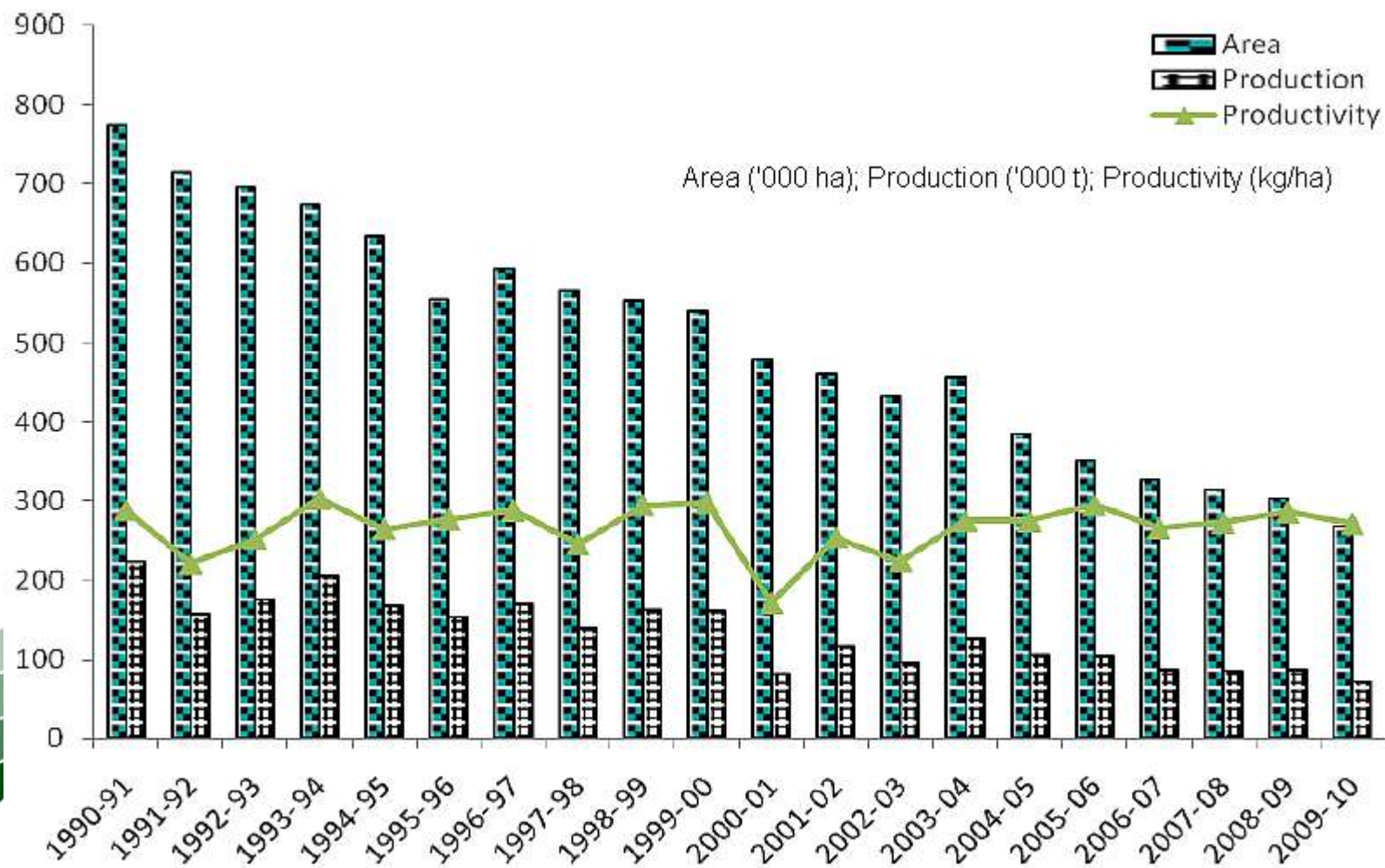


# Distribution of Small Millets in India





# Trend of area, production and productivity of Small millets in Madhya Pradesh



# Importance of NUS

- **Crop diversification** contributing significantly to improved health and nutrition, livelihoods, household food security and ecological sustainability
- Combating **World's Hunger** including “hidden hunger”
- **Support the lives of rural people** by providing food, fodder, fiber, medicine, fuel wood, and shelter
- Being low input crops, these are important for agricultural diversification and provide a unique opportunity to **combat food and nutritional insecurity** within the communities.



# Promotion strategies

- focusing on local values, indigenous knowledge and uses
- recognizing underutilized species as a public good
- focus on groups of species as models through case-study approaches
- promote cooperation among stakeholder groups and create national, regional and international synergies
- **analyze and enhance demand using market-oriented strategies**
- empower rural poor and strengthen their capacity to negotiate with the private sector and government
- mainstream gender-sensitive approaches in management and use
- inter-disciplinary work

Ref: <http://www.agriculturesnetwork.org/magazines/global/valuing-crop-diversity/underutilized-plant-species-what-are-they>

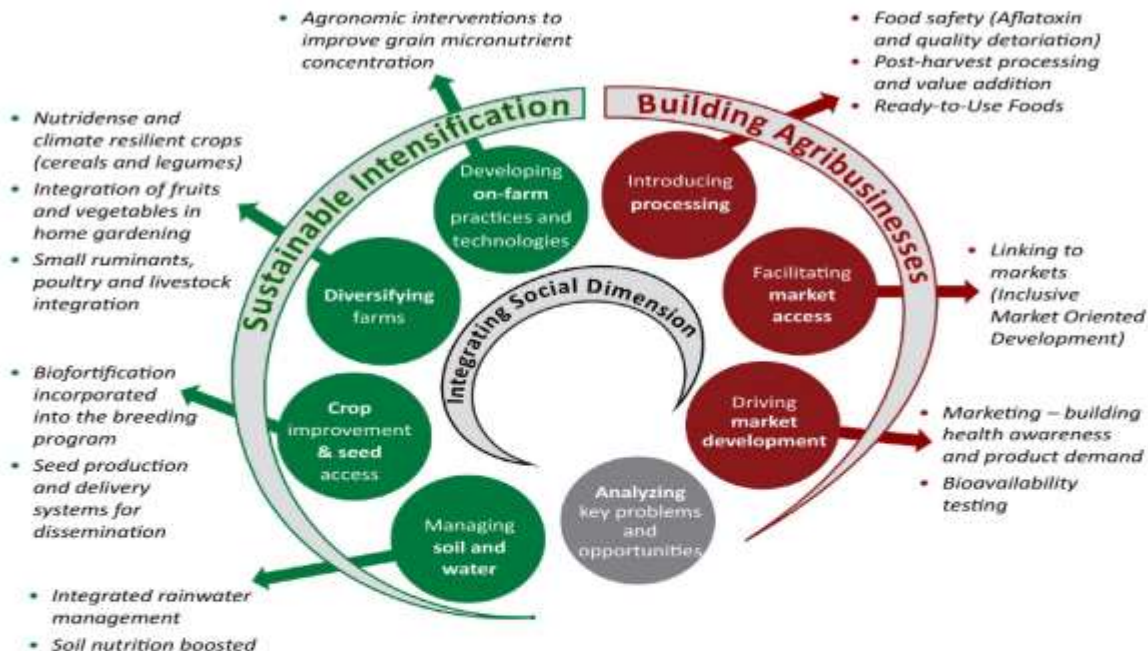
# IMOD





# Agricultural transformation agenda

## Nutrition across the whole agricultural research for development value chain



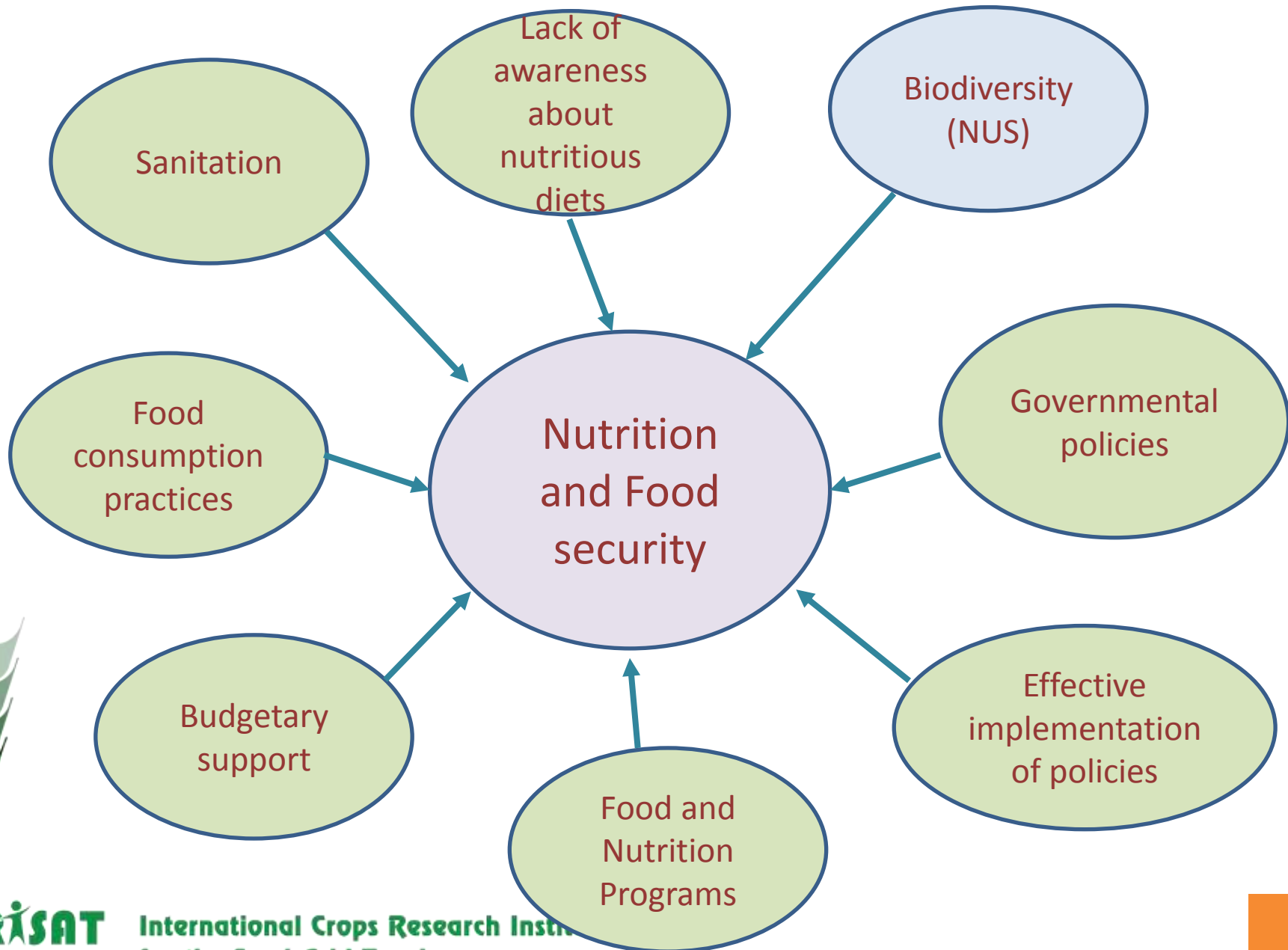
### Cross-cutting issues

- Empowering women – women are consulted, involved and supported to lead both on farm and with agribusiness
- Attracting youth to agriculture

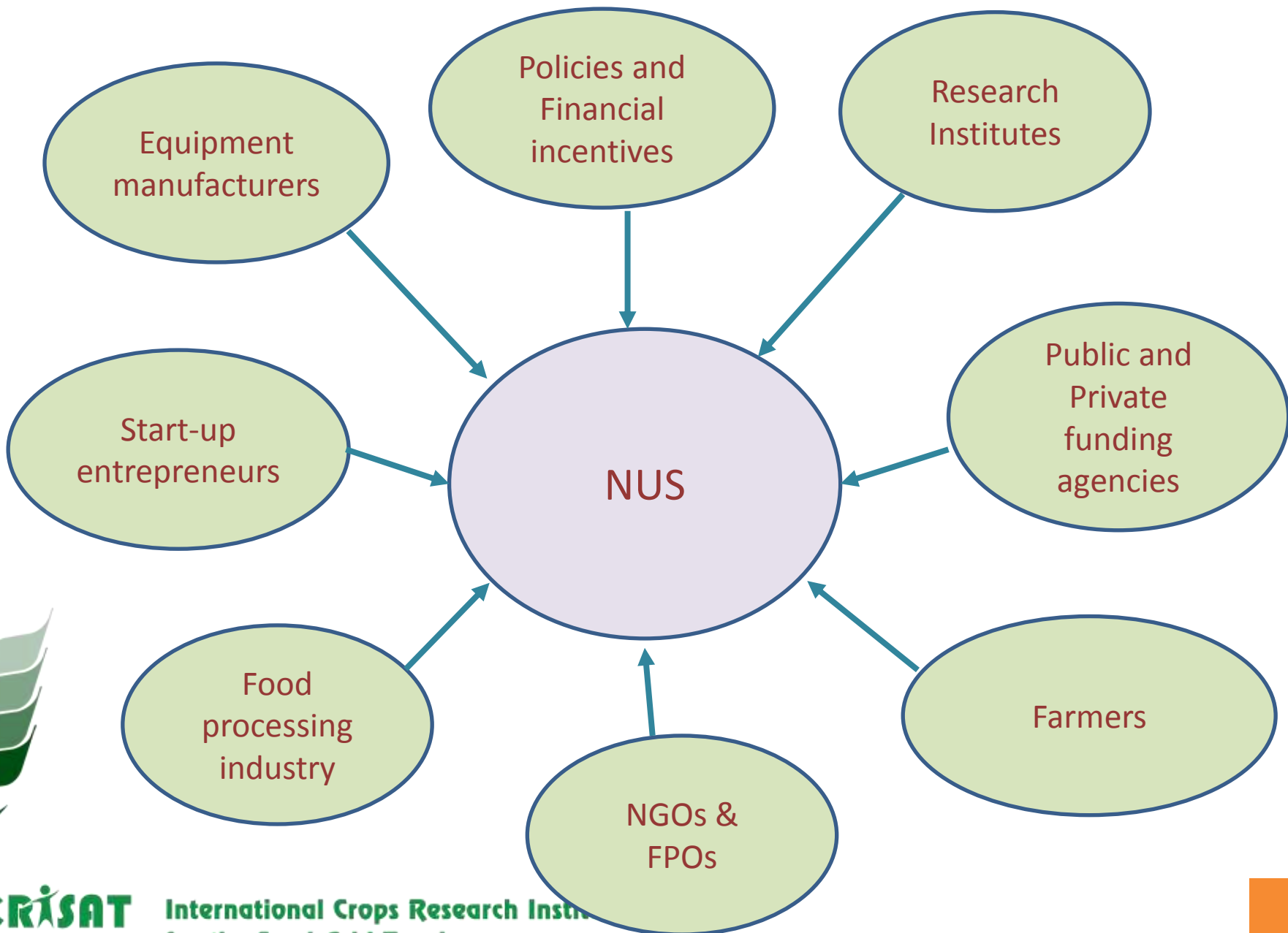
### Approach for Adoption

- Science-led participatory consortium approach & collective action
- Capacity building for empowerment
- Integrating ICTs - to build awareness and share knowledge, especially with women and youth
- Concurrent monitoring and evaluation – for feedback and adjustment
- Policy support – work closely with government to encourage the needed policies

# Holistic approach for addressing Nutrition and Food security



# Stakeholders across NUS value-chain



# Urgent Areas for Action

- **Institutionalize leadership for nutrition** within the PMO and Chief Minister offices
- **Prioritize universal coverage of selected evidence- informed essential nutrition interventions (ENIs)** with special focus on **under 2 years, pregnant women and adolescents**
- **Finance and deliver at scale the ENI** with active attention to equity
- **Ensure equitable access** to Food Security, primary health care, safe drinking water, sanitation, gender issues and age at conception
- **Position nutrition as a development indicator** and reliable data collection





## Way forward ...

- Consorted and coordinated efforts are needed towards **conservation, improvement and utilization of NUS**.
- Use locally grown crops (including NUS) and promote entrepreneurship/ community level value addition centers towards development of food products for addressing malnutrition.
- Effective implementation of various nutritional programs in consultation with all stakeholders.
- Include malnutrition as an indicator parameter in evaluating progress of various programs under different ministries.
- Promulgate a “Nutritional security bill” along the lines of “Food security bill”.



## ICRISAT's work on Nutrition

- The **NutriPlus Knowledge (NPK) program of ICRISAT** works towards understanding the nutritional potential of crops.
- **Explores opportunities for value addition** through identification of processing technologies and value added products to increase market value of the mandate crops.
- **Provides training, technology support** for food product and packaging development, labelling and regulatory support, and innovative post harvest processing solutions.
- **Conducts entrepreneur development workshops**, quality control and quality assurance (food safety) training programmes, conferences and symposiums.



# Few of the capabilities of NPK program laboratory

## Product Development Lab

## Analytical Lab

- Product development
- Proximate analysis – Protein, Fat, Fiber, Carbohydrates, Ash
- Starch profiling
- Amino acid profiling
- Fatty acid profiling
- Rancidity profiling
- Various prebiotic components such as  $\beta$ -glucans, Oligosaccharides, Arabinoxylans etc
- Shelf-life studies



# Few of the products developed at NPK program

## Fight against Hidden hunger



Instant Millet porridge

Micronutrient (Fe, K, Ca) rich sweet sorghum syrup & beverage



## Fight against Protein Energy Malnutrition



Energy dense spread – Peanut and Sorghum based Ready-to-Use-Therapeutic Food (RUTF)



Low Glycemic and gluten-free food products

Crispies prepared from Polyphenol-rich Sorghum



Crispies from normal Sorghum

Crispies from polyphenol rich Sorghum

Fight against Non-communicable diseases viz. Diabetes, Cardiovascular, Cancer etc

*Thank you!*

