

# TARGET PRELIMS 2024

## BOOKLET-21; ECONOMY-2

### AGRICULTURE AND RELATED ISSUES

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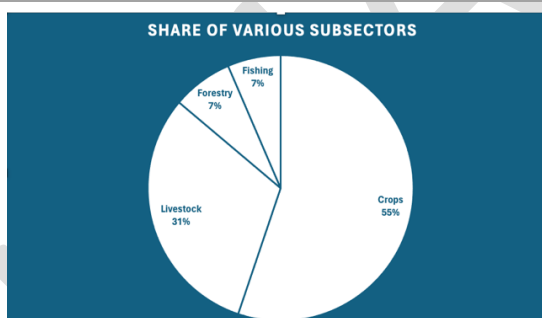
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## 2. AGRICULTURE AND ALLIED SECTOR: SHARE IN ECONOMY

- **Declining share of Agriculture** in India's economy:
  - It is estimated that at the time of independence Agriculture contributed to more than 50% of India's GDP and employed 2/3rd of the population.
  - Today, agriculture contributes to around 18% of India's GDP and employs more than 50% of India's population.
- **GVA Share:** According to Ministry of Statistics & Program Implementation (MoSPI), the GVA of agriculture and allied sectors in 2020-21 was 20.1%, it was 19% in 2021-22 and it again came down to 18.3% in 2022-23.
- **Distribution of various sub sectors:**

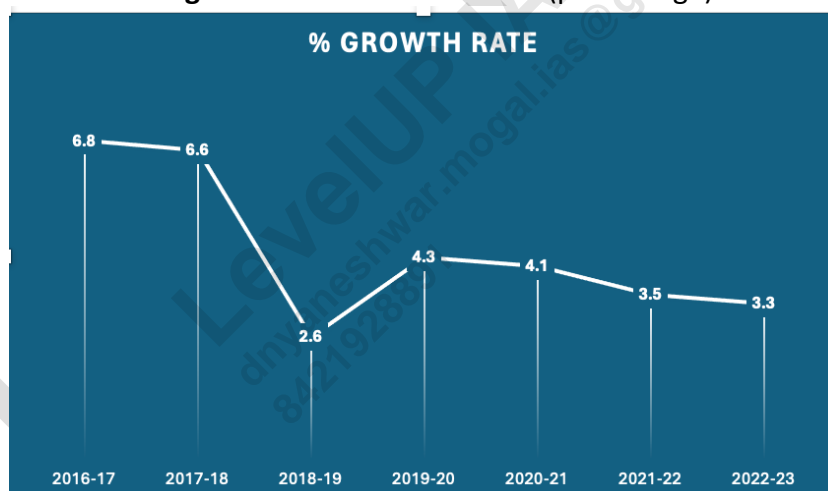
### FY22:

- Crops: 55%
- Livestock: 30.87%
- Forestry: 7.36%
- Fishing: 6.44%



- **Note:** Share of Livestock and fishery has been going up and share of Crops and forestry has been going down

- **Growth rate of Agriculture and allied sector** (percentage)



## 3. AGRI-CENSUS (2015-16) (RELEASED IN 2018)

- **Intro**
  - Department of Agriculture, Cooperation and Farmers Welfare, MoA&FW conducts a **quinquennial Agriculture Census** ( every five years) in the country to collect **key information about the structure and agriculture holdings in the country** and **monitor changes that take place over time**.

- **2015-16** census was the **10th Agri census** conducted in the country. (the first census was done in 1970-71)
  - **Note:** As of Jan 2024, 11th Agri-Census is going on. It was launched in July 2022.
- In the census, the unit of enumeration is defined by the term '**Operational Holding**' and it corresponds to the person who actually cultivates the land rather than its ownership. The concepts followed are broadly in conformity with the World Census of Agriculture, FAO of the UN.

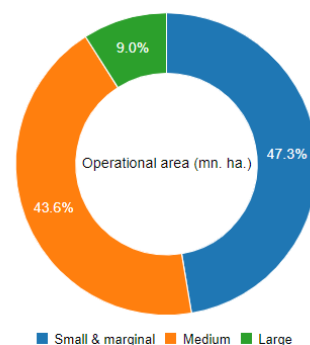
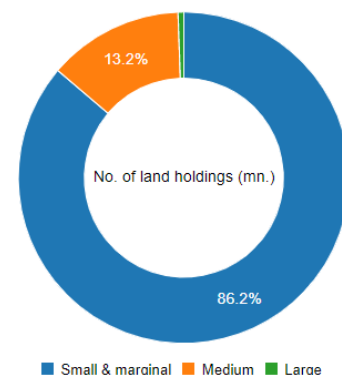
- **Some other terms to understand**

- **Operational Holding**
  - All land which is used wholly or partly for agricultural production **and** is operated as one technical unit by one person alone.
- **Operated Area**
  - Include both cultivated and uncultivated area, provided part of it is put to agricultural production during the reference period.
- **Size Classes**

| S.No. | Group       | S.No. | Classes (in ha.) |
|-------|-------------|-------|------------------|
| I.    | Marginal    | 1.    | Below 0.5 ha.    |
|       |             | 2.    | 0.5 – 1.0 ha.    |
| II.   | Small       | 3.    | 1.0 – 2.0 ha.    |
| III.  | Semi-medium | 4.    | 2.0 – 3.0 ha.    |
|       |             | 5.    | 3.0 – 4.0 ha.    |
| IV.   | Medium      | 6.    | 4.0 – 5.0 ha.    |
|       |             | 7.    | 5.0 – 7.5 ha.    |
|       |             | 8.    | 7.5 – 10.0 ha.   |
| V.    | Large       | 9.    | 10.0 – 20.0 ha.  |
|       |             | 10.   | 20.0 and above.  |

- **Key Highlights**

- **Decline in total operated area by 1.53%**
  - From 159.59 million hectares to 157.14 million hectares.
- **State wise total operated area is highest in:**
  - Rajasthan, followed by Maharashtra, UP, MP and Karnataka.
- **Total Number of Land Units (Operational holdings)**
  - **Increase of 5%** (from 138 million 2010-11 to 146 million in 2015-16)
  - **Uttar Pradesh** is the state with highest number of landholders, constituting 16% of the total number. UP is followed by **Bihar** and **Maharashtra**.
- **Small and marginal landholdings** (<2 hectare area) constituted **86.21%** of the total landholding, an **increase of 1.2%** points compared to 2010-11.
  - Farmers holding 10 hectares and more account for just **0.57%**.
  - Semi-Medium and Medium: 13.2%
- **Decline in average size of landholding** from 1.15 hectare to 1.08 hectare.
- Average size of farm holding was the **highest in Nagaland** at 5.06 hectares and **lowest in Kerala** at 0.18 hectares.
- It is noteworthy that **small, marginal and medium landholdings** constitute the lion's share of operated area - **large landholding** account for only 9% of the total operated area.



- **Marginal Increase in number of Small and Marginal agricultural land holdings** in the country
  - This means that there are more people now who own smaller parcel of land.
- **Percentage of women landholders have increased**
  - From 12.79% in 2010-11 to **13.87%** in 2015-16
  - There is also a corresponding increase of **1.2%** () in operated area.

## 4. INPUT MANAGEMENT

### 1) SEEDS

- **Introduction**
  - » **Good seeds** are catalysts for change in agriculture. The **Green Revolution** was ushered in by the import of 18,000 tonnes of high-yielding varieties of wheat seeds, Lerma Rojo and Sonaro-64, and IR-8 rice seeds.
  - » Today, India is AtmaNirbhar in staple crops and exports seeds to its neighbouring countries. This is thanks to these seeds and research conducted by ICAR.
- **Recognizing the significance of seeds government has taken several steps:**
  - » **Seed Production in Agricultural Crops:** This is a seed project to promote Seed Replace Rate (SRR) and Varietal Replacement Rate (VRR)
  - » **Sub-Mission on Seeds & Planting Materials**
    - The submission is focused on production and supply of quality seeds to farmers through its various components:
      - **Seed Village Program**
        - The program is aimed at upgrading the quality of farm saved seeds.
        - Under this by 2020-21, 4.29 lakh seed villages have been created wherein 38.01 lakh qtls. of foundation/certified seeds were distributed at concessional rates to 170 lakh farmers.
      - **Establishment of Seed Processing-cum-Seed Storage Godowns at Gram Panchayat Level**
        - Centre provides financial assistance to states to establish Seed processing-cum-storage godowns units each of 500 Mt capacity at Gram Panchayat Level.
      - **National Seed Reserve**
        - Under this seed of short and medium duration crops varieties are kept to meet the requirement of farmers for re-sowing during natural calamities and unforeseen conditions i.e. drought, cyclone and floods etc.
      - **Boosting Seed Production in Private Sector**
      - **Strengthening of Quality Control Infrastructure Facilities**

### A) REGULATION OF SEED SECTOR IN INDIA

- » Currently, the **Seeds Act, 1966** regulates the quality of seeds in India.
  - This was introduced right after the ushering of the 'Green Revolution' in India.

- The Act along with the **Seed Rules, 1968, Seed (Control) Order (1983), New Policy on Seed Development (1988)**, Plants Fruits & Seeds (Regulation of Import into India) Order (1989) has served well in making the Indian Seed Industry vibrant and competitive to serve the interest of farmers.
- **Protection of Plant Varieties and Farmers' Right Act (2001)** and the **Essential Commodities, Act 1955** have also served a role in the regulation of seed sector in India.
- » **Key highlights of the Seeds Act, 1966**
  - It only covers "notified kinds of varieties of seeds".
  - **Labelling of seeds** with notified quality parameters has been made **mandatory** under the 1966 Act with **punitive measures against seed sellers** in case of any deficiency in seed quality parameters mentioned on the label.
    - Essentially, the **seed label is treated as a guarantee card** and it is given a unique ID number to ensure traceability of seeds.
  - **Central Seed Committee** notifies any seed variety found suitable as per the act.
- » **Some limitations of Seeds Act, 1966**
  - It only covers notified kinds or varieties of seeds. Thus, seed varieties which are not officially notified are not covered.
  - **Seed variety registration** has been left to the discretion of the developers.
- » **The Draft Seeds Bill, 2019:** Hasn't progressed ahead because of various criticisms.

## B) OPEN SOURCE SEED MOVEMENT

- **Background:**
  - » The advent of hybrid seeds, GM seeds etc have conferred plant breeders and developers of new varieties with the so-called plant breeder's rights (PBR). In this regime, farmer's rights were limited while right-holders could demand royalty on seeds and legally enforce PBRs.
- **Need of Open-Source Seed Movement:**
  - » Decline in public sector breeding and increasing domination of private sector in seed breeding
  - » High prices of private sector owned seeds.
- **What are Open-Source Seeds?**
  - » Open-Source Seeds are those seeds which have been freed from IPR restrictions to allow open use of these seeds.
  - » In 1999, a Canadian plant breeder named **T.E. Michaels** suggested an approach to seeds based on the principles of open-source software.
  - » In 2012, Jack Kloppenburg, whose 1988 book ***First the Seed*** altered the world to trends in the seeds sector and the use of IP to control farmers' right, launched the '**Open Source Seed Initiative**' (OSSI) in Wisconsin. **OSSI simply asks for a pledge, that an individual won't restrict others use of these seeds or their derivatives by patents or other means, and to include these pledges with any transfer of these seeds or their derivatives.**
    - Since then several programs have come up around the world.

- » In India, the Hyderabad based Centre for Sustainable Agriculture (CSA), part of the **Apna Beej Network**, developed a model incorporated into an agreement between CSA and the recipient of the seed/germplasm.

## 2) IRRIGATION

### - Introduction

- » Irrigation is crucial to ensure that farmers reap full benefit of better-quality seeds and fertilizers. But, as per ESI 2021-22, only 49% of India's total cropped area is irrigated. Rest depends on Monsoon rainfall for agriculture. This is the most important factor which makes farming a vulnerable profession.

### - Importance of Irrigation:

1. **Insufficient, Uncertain and Irregular Rains**
2. **Higher Productivity of Irrigated Fields**
3. **Multiple Cropping Possible**
4. **Brining More Land Under Cultivation**
5. **High Yielding Varieties Program's** success depends to a large extent on the timely availability of ample supply of water.
6. **Reduces Instability in output levels**
7. **Other Indirect Benefits of Irrigation:** employment potential of irrigated land increases. It also helps in developing allied activities, means of water transport etc.
  - For e.g. it has been estimated that for every Rs 100 of direct benefits from Bhakra Nangal Dam, there was a generation of Rs 90 of indirect benefits.

### A) DIFFERENT TYPES OF IRRIGATION IN INDIA:

- » Sources of Irrigation in India can be divided into the following: (i) **Wells/Tube Wells** (ii) **Canals** (iii) **Tanks**, and **Others**
- » **Wells and Tube-wells** are the most important source of irrigation in India.
  - They are spread over large areas of Punjab, Haryana, Uttar Pradesh, Bihar, Rajasthan, and Tamil Nadu.
  - **Advantages of Well and Tube well Irrigation:** Simplest and cost-effective way, easily affordable by poor Indian farmers (wells). It is an independent source of irrigation and can thus be used whenever the necessity arises. Certain chemicals from ground water such as nitrate, chloride, sulfate etc. are generally found mixed in well water. This can be good for agriculture.
  - **Disadvantages:**
    - Only limited area can be irrigated (upto 1 to 8 hectare of land per day)
    - Excessive extraction has caused ground water depletion in several parts of the country.
- » **Canals** contribute to irrigation of around 24% of the irrigated area. This includes large area of Punjab, Rajasthan, Haryana, Uttar Pradesh, Bihar and some parts of southern states.



- Digging of Canals in stony and uneven areas is difficult and unprofitable. Thus the canals are practically absent from the Peninsular plateau. However, the coastal and delta region of south India do have some canal system.
  - **Advantages of Canal Irrigation:**
    - Canals can convert dry regions into fertile territory (e.g. Rajasthan impacted by Indira Gandhi Canal)
    - They carry a lot of sediments carried by rivers -> this when deposited in agri field contributes to soil fertility.
    - It's quite cheap in long run (initially it can be expensive due to the cost of multipurpose projects etc.)
  - **Drawbacks:**
    - **Water logging** along the canal route: It is caused by soaking on canal water into the ground.
    - **Land Degradation:** Capillary action brings alkaline salts to the surface and makes large areas unfit for agriculture.
    - **Overflow of canals during rainy season** also becomes a reason for floods.
  - Taken together, Canals and wells accounted for 86% of the irrigated area in 2012-13.
- » **Tank Irrigation** is resorted to mostly in Telangana, Andhra Pradesh, Tamil Nadu, and parts of West Bengal and Bihar.
  - A **tank** act as an irrigation storage system that is developed by constructing a small bund of earth or stones built across a stream.
  - Rivers of south don't flow all the year around. Therefore, tanks are constructed for storing water in rainy season which is subsequently used for irrigation purposes.
  - **Andhra Pradesh** (including Telangana) is the largest state of tank irrigation which has about 29% of tank irrigated area of India. The drainage system of Godavari and its tributaries have a large number of tanks.
  - **Advantages:**
    - Most of the tanks are natural and not expensive for their construction. Even an individual farmer has his own tank.
    - They are generally constructed on a rocky bed and has long life.
    - Fishing activities in some tanks adds to the food resources and income of the farmers.
  - **Limitations:**
    - They dry up during dry season and fail to provide the irrigation when it is needed the most.
    - **Silting** of the tank bed is a serious problem and it requires desilting of the tank at regular interval.
- » **Micro Irrigation** (including Sprinklers, Drip Irrigation Etc.) have emerged as the new efficient way of irrigation.
- **Various Initiatives** to promote increase irrigation cover in India:
  1. **Accelerated Irrigation Benefit Program (AIBP)** was launched in 1996-97 to provide Central Loan Assistance to states for completion of large and medium irrigation project which have been stuck for long due to fund crunch. It has been now subsumed under PMKSY (PMKSY-AIBP)



2. **Pradhan Mantri Krishi Sinchai Yojana (PMKSY)** is operational since 2015 with the vision of extending the coverage of irrigation "Har Khet ko Pani" and Improving water use efficiency "More Crop Per Drop".
3. **Promoting water use efficiency:**
  - To promote **micro-irrigation a Micro Irrigation Fund (MIF)** with corpus of Rs 5,000 crore was created with NABARD during 2018-19. As of 1st Dec 2021, loans under MIF amounting to Rs 3,970.17 crores have been approved for 12.81 lakh ha of Micro Irrigation area.
  - Micro irrigation is also being promoted through the Per Drop More Crop component of PMKSY (PMKSY-PDMC) from 2015-16.
4. **Watershed Development Program** (now part of PMKSY) also focuses on improving irrigation situation in rain-fed area.

## B) PRADHAN MANTRI KRISHI SICHAYI YOJNA

### - Introduction:

- » Pradhan Mantri Krishi Sinchayi Yojna (PMKSY) is a flagship scheme launched by Government of India in 2015. the main objective of the PMKSY is to:
  - i. Achieve convergence of investments in irrigation at the field level.
  - ii. Expand cultivable area under irrigation ("Har Khet ko Pani")
  - iii. Improve on-farm water use efficiency ("More Crop Per Drop") to reduce wastage of water, Enhance the adoption of precision irrigation and other water saving technologies (Per Drop More Crop)
  - iv. Enhance recharge of aquifers and introduce sustainable water conservation practices by exploring the feasibility of reusing treated municipal waste water for peri-urban agriculture and attract greater private investment in precision irrigation.

### - Key Features of the Scheme:

- » **Amalgamation of Ongoing Schemes:**
  - Accelerated Irrigation Benefit Program (AIBP) of Ministry of Water Resource, River Development & Ganga Rejuvenation (MoWR, RD&GR) (Now Ministry of Jal Shakti)
  - Integrated Watershed Management Program (IWMP) of Department of Land Resources (DoLR) - MoRD
  - On Farm Water Management (OFWM) of Department of Agriculture and Cooperation - Ministry of Agriculture and Farmer Welfare
- » **Decentralized State-Level Planning and Execution:** States will draw their own irrigation development plan based on district irrigation plans and state irrigation plans.
- » It serves as a **convergence platform** for all water sector activities including drinking water and sanitation, MGNREGA, application and S&T through comprehensive plan.
- » **Focused on "Protective Irrigation"** by sustainably water conservation by harnessing rain water at micro level through 'Jal Sanchay' and 'Jal Sinchan'
- » **Special Focus on Micro-Irrigation** to increase water use efficiency.
- » **Other objectives** include enhancing recharge of acquifers and introducing sustainable water conservation practice by exploring the feasibility of reusing municipal waste water and peri-urban agriculture and attract greater private investment in precision agriculture.

- The program has now been **extended for another five years till Dec 2026**. Three components AIBP, Har Khet ko Pani and Watershed development has been extended.

### C) ACCELERATED IRRIGATION BENEFIT PROGRAM

- **Need of AIBP**
  - » Irrigation a state subject -> states develop irrigation projects -> several **major and medium projects** were stuck due to inadequate provisions of funds locking the fund spent on these projects too.
  - » Keeping the above in view, Central government in **1996-97**, launched an Accelerated Irrigation Benefit Program (AIBP) to provide **Central Loan Assistance (CLA)** to these projects so that development could be accelerated.
  - » Central assistance is released in the form of block loans and grants not tied to any sector of development or project.
- **Types of Projects chosen**
  - » Special emphasis was to be given to Pre-fifth and Fifth Plan Project.
  - » Priorities were also to be given to those projects which were benefitting Tribal and Drought Prone Areas.
  - » After the revision in 1999-2000 onwards, AIBP could also be extended to minor surface irrigation projects of special category states (N.E States & Hilly state of HP, Sikkim, J&K and Uttarakhand)
- **State's contribution (after relaxation in Dec 2006)** [25% (10% in special category states, projects benefitting draught prone areas, tribal areas, and flood prone areas)]
- **Progress as of Dec 2021**
  - » Out of 99 projects, 44 projects have been reported to be completed/almost completed.

### D) LONG TERM IRRIGATION FUND (LTIF)

- It was established by NABARD in 2016 to fund central and state share of 99 prioritized irrigation projects under the PMKSY.
- It gives **loans to NWDA and State governments** for the irrigation projects and thus funds and fast tracks implementation of incomplete major and medium irrigation projects during 2016-2020.
- **99 Projects of AIBP** which have been identified:
  - » 23 Projects for completion in 2016-17 (Priority-1)
  - » 31 Projects for completion in 2017-18 (Priority-2)
  - » 45 projects for completion by Dec 2019. (Priority-3)
- It had an initial corpus of about Rs. 20,000 crore (which was later extended to **40,000 crores**)
  - » The corpus will come from budgetary allocation from Gol, extra-budgetary allocation through Gol fully serviced bonds to be raised by NABARD.

### E) INSTITUTIONS: NATIONAL WATER DEVELOPMENT AGENCY (NWDA)

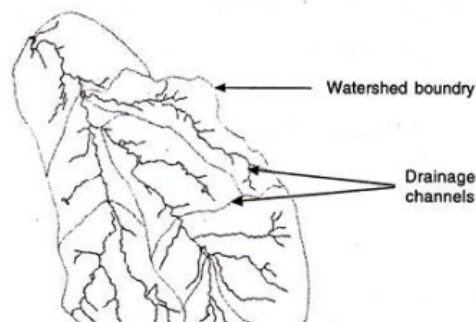
- NWDA was set up in 1982 as Autonomous society under the Societies Registration Act of 1860, to carry out the water balance and other studies on a scientific and realistic basis for optimum utilization of water resources of the Peninsular river system for preparation of feasibility report and thus to give concrete shape to **Peninsular River Development component of National Perspective Plan prepared by Central Water Commission**.

- Government subsequently modified the functions of NWDA to include the Himalayan Component of National Perspective for Water Resource Development.
- In 2006, it was also decided that NWDA will explore the feasibility of linking sub-basins of rivers in state like Bihar.
- It has also been tasked to prepare feasibility reports of intra-state links as proposed by the States

### 3) WATERSHED DEVELOPMENT PROGRAM

#### - Introduction

- » **Watershed** is an area of land where surface water drains down to a single point (stream, lake or ocean).
- » **Watershed development/management** is the treatment of the entire catchment area around the village to ensure conservation and regeneration of natural resources, especially water and its judicious use.
- » Watershed development is all about making running water stop and standing water to sink inside. It is the only option for rainfed areas for water conservation and recharge and to prevent soil degradation.



#### - How is watershed development done?

- » It is done from ridge to valley basis. Watershed development starts from the top-most point (ridge) and progresses downwards towards the valley.
  - Structures such as Water absorption trenches (WAT), Continuous contour trenches (CCT), stone bunds, check dams, percolation dams, ponds, and channels are built from the ridge to the valley.
- » **Main objective is to slow the movement of water**
- » **Note:** Earlier method of focusing only on water storage structures had limitations like washing away of top soil and silting of the water storage structure (reduction in the capacity to store water).

#### - Watershed Development Programs in India: Key Programs

- Integrated Watershed Management Program (now a component of PMKSY)
- National Watershed Development Project for Rainfed Areas (NWDPR)
- Watershed Development Project in Shifting Cultivation Area (WDPSCA)
- Watershed Development Fund (WDF)
  - With the help of NABARD
  - Unified fund to help various watershed development programs in India.

#### - How has watershed management programs contributed/ What are the objectives of these program?

- » Water Conservation, Soil Conservation, Flood Control, Rehabilitation of Degraded Land, Better agri practices, better integration of non-agri activities, Increased farmer income, capacity building of farmers.

#### 4) MICRO-IRRIGATION

##### - Introduction

- » Water is a scarce natural resource and faces a huge demand supply gap all over the world. Situation is worse in India which accommodates 17% of the world's population with 4% of the water resources.
- » In India, more than 80% of water is used for irrigation purposes. Therefore, optimal utilization of water in irrigation can play crucial role in ending the water scarcity that exists. Here, micro-irrigation can play a crucial role.

- **Micro Irrigation** is an innovative water saving technology in which water is directly supplied to crops with very less conveyance and evaporation losses. Main types of micro-irrigation system include:

- Drip Irrigation:** It allows water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface.
  - In India, major crops cultivated under drip irrigation includes sugarcane, banana, cotton, lemon, grapes, oranges, mangoes, vegetables etc.
- Sprinkler Irrigation:** It uses water sprinklers to irrigate agri-crops. The water is applied in a controlled manner in a method that is similar to rainfall.
  - In India, major crops cultivated under sprinkler irrigation include, wheat, mustard, millet, sorghum etc.
- Micro-Sprinkler Irrigation** provide irrigation with very fine droplets. They are suitable for low volume irrigation in horticulture crops, fruit flowers, greenhouses, nurseries etc.
- Porous Pipe System:** It is a system of sub-surface irrigation which can work on low pressure that can be provided by gravity (overhead tanks).
  - Water is dispensed gradually near the roots of the plant/tree.
- Rain Gun**
  - Pressurized water through rain-guns are used to irrigate the crop.

- Drip Irrigation and Sprinkler Irrigation is the most common type of micro-irrigation system used in India.

##### - Benefits of Micro Irrigation

- Better water use efficiency, better fertilizer use efficiency, energy efficiency, increased productivity, crop diversification, better quality of produce, more income for farmers etc.

##### - Efforts towards promoting Micro-Irrigation in India

- National Mission on Micro Irrigation Program** which was later subsumed under **National Mission on Sustainable Agriculture**.
  - It is now being implemented as "Per Drop More Crop" component under Pradhan Mantri Krishi Sinchai Yojana (PMKSY) from 2015-16.
  - Under it various **Training and Awareness Programs, workshops, seminars and interactive meets** are conducted.

- **50% subsidy** is provided to farmers for installing micro-irrigation system (MIS). (40% Centre, 10% state)
- ii. **Micro-Irrigation Fund with NABARD under PMKSY**
  - It was set up in 2018 with the major objective of funding the states to facilitate them to mobilize resources which can be used to incentivize farmers towards micro-irrigation beyond the provisions available under PMKSY-PDMC.
  - Its initial corpus was Rs 5,000 crore which was increased to 10,000 crore in Budget 2020-21.

## 5) AGRI-INPUT: MECHANIZATION

- **Introduction**
  - Farm/Agri mechanization is the process of replacing human and animal labour with machines in agriculture sector. The use of tractors, threshers, harvesters, pump sets etc. are all steps towards farm mechanization.
- **Advantages of Farm Mechanization-**
  - Increased Productivity - Reduced time and labor - Reduced Cost - Increased soil fertility - reduced water use - Reduced post-harvest losses - no labor bottlenecks - create skilled jobs - Overall increased income for farmers.

### A) INITIATIVES FOR AGRI-MECHANIZATION

#### 1. Sub-Mission on Agriculture Mechanization (SMAM)

- Launched in 2014-15
- Ministry: MoA&FW
- Objective
  - » To promote agricultural mechanization among small and marginal farmers.
- Under the scheme, assistance is provided to state governments to:
  - » Impart training and demonstration of agriculture machinery;
  - » Provide assistance to farmers for procurement of various agri-machineries and equipment and;
  - » For setting up of Custom Hiring Centers.
- Progress:
  - » As of Dec 2022, 21628 CHCs and 467 Hi-tech hubs and 18306 farm machinery banks have been established.

#### 2. The Scheme for CRM (Crop Residue Management): 'Promotion of Agriculture Mechanization for In-situ management of Crop Residue in the State of Punjab, Haryana, Uttar Pradesh and NCT of Delhi'

- Initiated in 2018
- **Ministry:** MoA&FW, Central Sector
- Farmers are provided machinery for in-situ management of crop residue through establishments of **Custom Hiring Centers**. **80% subsidy** is provided for establishment of CHCs.
- **Individual farmers** are provided subsidy (50%) for procurement of machinery.

- **In Budget 2020-21** a total allocation of Rs 600 crore has been provided of which Rs 548.20 crore has already been released.

### 3. Multilingual Mobile App - "CHC - Farm Machinery"

- It connects farmers with CHCs situated in the locality.
- It facilitates agri-mechanization in the country by encouraging small and marginal farmers to take machines on rental basis for agri-practices.
- The app has been further modified and now has been given the acronym of "**FARMS-App**" (Farm Machinery Solutions - App). This version is more user friendly, and the scope of the app has been enhanced.

4. **Other** Schemes of the ministry such as RKVY, NFSM, NHM, NMOOP etc also promote farm mechanization.

### 5. Other steps

- Government has decided to enhance farm power availability from 2.02 KW per ha (2016-17) to 4.0 kW per ha by the end of 2030.

## B) REPORT: THE STANDING COMMITTEE ON AGRICULTURE, ANIMAL HUSBANDRY, AND FOOD PROCESSING (CHAIR: MR. P.C. GADDIGUDAR) PRESENTED ITS REPORT ON "RESEARCH AND DEVELOPMENT IN FARM MECHANIZATION FOR SMALL AND MARGINAL FARMERS IN THE COUNTRY" ON JULY 21, 2023

- **Status of Farm Mechanization:** As of Aug 2022, 47% of agricultural activities are mechanized in India. This is lower than other developing countries like Brazil (75%) and China (60%).
- **Mechanization level** in different crops:

| Crop  | Rice | Wheat | Pulses | Sugarcane | Overall |
|-------|------|-------|--------|-----------|---------|
| Level | 53%  | 69%   | 41%    | 35%       | 47%     |

- **Small Holdings:** Unless machines appropriate for small holdings are made available or substantial farm land consolidation takes place, small farmers will find it difficult to purchase their own machinery.
- It will take country 25 years to achieve 75-80% mechanization. It recommended that government should take steps to do it in less than 25 years.
- **Key recommendations:**
  - » **Government should publicize** initiatives like Custom Hiring Centres etc.
  - » **Design Standardization** should be achieved to ensure interchangeability.
  - » **Under Sub-Mission on Agri Mechanization** - Government should promote low cost equipment - to increase the reach to small and marginal farmers.
  - » **Increase the availability of farm power** to 4 KW per hectare (from current 2 Kw per hectare)
  - » **Study to assess farm mechanization** - The committee has recommended that Department of Agriculture and Farmers' Welfare prepare a plan for such study

## 6) AGRI-INPUT: CROP INSURANCE

- **Background: Why didn't Farmers participate in agri-insurance Schemes?**



- » NSSO report 573 (2012-13) identified following as the main reason for farmers not insuring their crops - **Non awareness, not interested, non-availability, lack of resources, complex process and Delays** in claim payments
- **Problems with Crop Insurance Scheme before PMFBY** -> Partial Risk Coverage; Available only for notified crops; High Premium Rates; Complex system -> lack of uniformity; Delays in claims settlement; very less focus on awareness generation.

## A) PRADHAN MANTRI FASAL BEEMA YOJANA (PMFBY)

- **Introduction**
  - » In a bid to protect farmers against losses incurred because of frequent changes in weather patterns, the PMFBY was launched in Feb 2016 and was implemented from Kharif 2016 (June 2016). It replaced the NAIS and MNAIS. However, WBCIS and Coconut Palm Insurance Scheme have continued to operate. Premium paid under WBCIS has been brought on par with PMFBY.
- **Key Improvements:**
  - » **Higher losses coverage** (pre harvest to post harvest losses)
    - Provision of claims upto 25% of sum insured for prevented sowing.
    - It covers post-harvest losses also.
    - It expands the definition of disaster to include aspects like flooding of crops and damage after harvest.
      - Provision of individual farm level assessment for Post-harvest losses against the cyclonic & unseasonal rains for the crops kept in the field for drying upto a period of 14 days, throughout the country.
  - » **Full Coverage:** No upper limit on government subsidy -> Doesn't cap premium rates, so that farmers can get full sum assured.
  - » **Uniform low premium rates for farmers**

| Crop                                     | Premium charged     |
|--|---------------------|
| Kharif                                   | 2.0% of sum assured |
| Rabi                                     | 1.5% of sum assured |
| Annual Commercial and horticulture crops | 5% of sum assured   |
  - » **Uniformity in implementation:** Districts are allotted to insurance companies on cluster basis for a longer duration to ensure uniformity in implementation of the scheme.
  - » **'Area Approach Basis' and 'Individual Insured farm'**
    - The scheme is implemented on an 'Area approach basis'.
      - Admissible claims are worked out and paid directly to the insured farmer's account by the insurance companies on the yield data based on the requisite number of CCE's per unit area furnished to the concerned insurance company.
    - **Individual Insured Farm approach:**
      - Losses due to localized calamities like hailstorms, landslides, inundations etc. are calculated on an individual-insured farm basis.
  - » **Subsidy shared between center and state**



- » **Provisions for quick settlement of claims**
    - **Note:** Operational guidelines under PMFBY require state governments to carry out at least four CCEs in every village panchayat for every notified crop and submitted the **yield data to insurance companies within a month of the date of harvest**. The companies have to **settle the claims within three weeks of receiving CCE data**.
  - » **Increased Use of Technology:** The use of technology will be promoted to greatest extent possible. Remote sensing, smart phones and drones will be used for quick estimation of the crop losses and early settlement of claims.
  - » The scheme is implemented through **empaneled general insurance companies**.
  - » The Scheme covers all Food & Oilseed crops and Annual/Horticulture Crops for which past yield data is available and for which requisite number of CCEs are being conducted under the General Crop Estimation Survey.
- **The scheme PMFBY and Restructured Weather Based Crop Insurance Scheme were made voluntary for all farmers, post its revamp in Feb 2020.**
    - Further, the states have been provided flexibility to rationalize the sum insured so that adequate benefits can be availed by farmers.
  - **Other steps to improve the implementation of schemes:**
    - **National Crop Insurance Portal** has been developed to handle all grievances from end to end. This portal is equipped with the necessary features, such as complaint/Query capturing through multiple modes, farmer authentication etc.
    - A provision of Stratified Redressal Mechanism, viz., District Level Grievance Redressal Committee (DGRC), State Level Redressal Committee (SGRC) has been made.
  - **The scheme wants to support sustainable production of Agriculture sector by way of financial support; stabilizing income; promoting adoption of innovative and modern practices; ensuring flow of credit to agri-sector.**
  - **Progress So far:**
    - As per ESI 2022-23, PMFBY is the **largest crop insurance scheme** in the world in terms of farmer enrolments, averaging 5.5 crore applications every year and the third largest in terms of premium received.
    - During the last six years of its implementation, farmers paid a premium of Rs 25,186 crore and received claim accounting to Rs 1.2 lakh crore (as of Oct 2022)
    - The acceptability of the scheme among farmers can be ascertained from the fact that the share of non-loanee, marginalized, and small farmers have increased by 282% since the scheme's inception in 2016.

## 7) AGRI-INPUT: AGRI-CREDIT

- Agriculture credit as a percentage of Agriculture GDP increased form **2% percent in 1970s to 47% by 2019-20**, portraying significant progress made in lending to agriculture.

- In the Union Budget for FY24, the Union government has set the Agri Credit Target to 20 lakh crore. This indicates an increased focus of government on agri-credit sector as there is an one-one-one correspondence between growth of agri-credit and agri-production
- **Key steps to promote Agri-Credit:**
  - i. **Nationalization of Commercial Banks** in 1969, Establishment of **Regional Rural Banks** in 1976 and setting up of **NABARD in 1982** have been some of the biggest steps towards increasing farm credit.
  - ii. **Priority Sector Lending (PSL)** norms initiated in 1974, mandates all domestic commercial banks (and foreign banks with 20 or more branches) to  earmark 18% of loans for farm credit.
  - iii. **Kisan Credit Card (KCC)** introduced in 1998 are aimed at providing adequate and timely short term credit needs for farmers and has now been extended to fishery and animal husbandry sector also.

**Kisan Credit Card (KCC) scheme** was introduced by NDA government in Aug 1998 with an aim to provide adequate and timely short term credit needs for farmers during the cropping season.

    - » NABARD has prepared a Model Kisan Credit Card Scheme in consultation with major banks on the basis of **R V Gupta Committee** recommendations.
    - » **Objective and Rationale** -> adequate, timely and cost effective credit; simple process; protect from usurious money lenders.
  - iv. **Modified Interest Subvention Scheme**, operational since 2006-07, provides short term agri credit of upto Rs 3 lakh at a subsidized interest rate of 7% per annum to farmers engaged in agriculture and allied activities.
    - An **additional 3% subvention** (Prompt repayment incentive) is also given to farmers for prompt and timely repayment of loans.

## 8) AGRI-INPUT: FERTILIZERS

- **Why in news?**
  - » CACP recommends Centre to bring urea under NBS regime to check overuse (June 2023)
- **Introduction:**
  - » A fertilizer is any organic or inorganic, natural or synthetic material added to soil to supply one or more plant nutrients essentially to the growth of plants.
  - » These fertilizers provide **six macro nutrients** and **8 micro-nutrients** to plants for well balanced growth:
    - i. **6 macronutrients:** nitrogen(N), phosphorus(P), potassium(K), Calcium (Ca), magnesium (Mg), and sulphur(S). They are consumed by plants in larger quantities and make the bulk of fertilizers.
    - ii. **8 Micronutrients:** Boron (B), Chlorine (Cl), Copper (Cu), iron (Fe), manganese (Mn), Molybdenum(Mo), Zinc (Zn) and Nickel (Ni).
  - » Fertilizer are an important input for agriculture and have played a major role in increasing farm productivity since green revolution.
  - » But Indian farmers have often faced difficulties due to **shortage of fertilizers** in past. So, the government, giving high priority to farmer's welfare, has taken a number of initiatives to ensure supply of fertilizers around the year.

- » **Scale of Fertilizer Subsidy:**
  - » 2021-22: Rs 1.62 lakh crore
  - » 2022-23: Rs 2.55 lakh crore
  - » 2023-24: Rs 1.75 lakh crores (Budgetary Allocation)
- » The two main important fertilizer subsidy schemes are Nutrient Based Subsidy Scheme and Urea Subsidy Scheme

## A) NUTRIENT BASED SUBSIDY (NBS) SCHEME

- **Key provisions of NBS**
  - » **Fixed subsidy based on nutrient:**
    - Government provides a fixed amount of subsidy based on the nutrient content (both macro and micro (boron, zinc etc.)) (per kg) of fertilizers (unlike the earlier product-based subsidy scheme) to the fertilizer companies.
    - For e.g. for RAB 2022 (from 01/10/2022 to 31/03/2023) - Subsidy rate was decided as follows:
      - **N (Rs 98.02/kg) P (Rs 66.93/Kg), K (Rs 23.65/Kg) and S (Rs 6.12/kg)**
  - » **MRP to be fixed by fertilizer companies** on the basis of demand and supply but after incorporating the subsidy element.
  - » Rate of subsidy is determined by various factors such as international prices, exchange rate, inventory levels etc.
  - » The NBS scheme currently covers 21 grades of different phosphatic and potassic (P&K) fertilizers including DAP (diammonium phosphate), MOP (Murate of Potash) and other NPK complex fertilizers.
  - » **UREA has been kept outside the coverage of the NBS scheme.**
- **Key Aim** -> Reduced Subsidy Burden; New specialized variety of fertilizers; Balanced application; Improved farm output; promote indigenous fertilizer industry.
- **Hasn't been as effective** -> Government's subsidy burden still very high -> UREA kept out of NBS, so farmers shifted to UREA -> Balanced Nutrient Goal also missed.
- Subsidy burden remained very high.

## B) UREA SUBSIDY SCHEME

- **Introduction:**
  - To ensure affordable access to fertilizers to farmers, UREA is made available at **statutorily controlled price**, which at present is Rs **5378 per MT** (exclusive of Central/State Tax and other charges towards neem coating).
  - The difference between the delivered cost of fertilizers at farm gate and MRP payable by farmers is **given as subsidy to the fertilizer manufacturer/importer by Govt.**
  - **Urea Subsidy Scheme** is a part of Central Sector Scheme of Department of Fertilizers
  - It also includes imported urea subsidy which is directed towards import to bridge the gap between assessed demand and indigenous production of Urea in the country. It also includes freight subsidy for movement of across the country.

## - **Issue of Diversion**

- Being super-subsidized, urea is always **prone to diversion for non-agricultural use** - as a binder by plywood/particle board makers, cheap protein source for animal feed manufacturers or adulterant by milk vendors - apart from being smuggled to Nepal and Bangladesh.
- From 2018, the government announced the **implementation of DBT** for disbursement of fertilizer subsidy.
  - Now the subsidy transfer only happens after the actual sales to farmers by retailers. Retailers have a point of sale (PoS) machine linked to e-Urvarak DBT Portal. Fertilizer buyers (farmers) are required to furnish Aadhar or KCC number.
  - **Advantages**
    - **Prevents diversion and plug the leakages** (because Aadhar is used)
    - Timely payment of Urea subsidy to urea manufacturing companies.
    - Adequate availability of UREA to farmers at adequate prices.
- **But the diversion still continues at the retail level.**
- **Various steps being proposed to deal with this problem:**
  - **Plans for Direct Cash Transfer to Farmers:**
  - **Plans to cap the total number of subsidized fertilizer bags that any person can buy during an entire Kharif and Rabi Cropping season:**
    - This is expected to end even retail-level diversion and purchases by large buyers masquerading as farmers.

## C) SOME STEP WHICH HAVE BEEN TAKEN TO MAKE UREA SECTOR EFFICIENT

- i. **GAS Price Pooling**
  - » Earlier, different urea plants got gas at different prices, so their cost of production differed.
  - » Therefore, in 2015 government has approved a major policy intervention. Under this policy the **domestic gas is pooled with imported LNG gas** to provide uniform natural gas to all the Urea manufacturing plants for the production of Urea.
    - **Cost of UREA at pooled price will be less than the price of imported urea**. This will help in increasing the production. This will augment indigenous production capacity.
- ii. **Neem Coating of UREA**
  - Reduces rate of dissolution in soil -> slowly absorbed by plants
  - Reduces diversion to industry
  - Neem has other advantages for crops -> insecticidal and pesticidal properties
  - UREA can't be used in synthetic milk now
- iii. **New Urea Policy** to increase the productivity, efficiency and indigenous production
- iv. **Introduction of 45 kg Urea Bag** (from earlier 50 kg) -> aimed at cutting demand
- vi. **Nano Urea**
  - Government has notified the specification of Nano nitrogen under Fertilizer Control Order, 1985.
- vii. **One Nation One Fertilizer Scheme**

- It aims to ensure timely supply of fertilizers as well as eliminate the dilemma of farmers in choosing one of the many brands available in the market.
- **By Ministry of Chemicals and Fertilizers**
- It aims at marketing fertilizers in India under '**Bharat**' brand name.
  - i. Under this scheme, all subsidized fertilizers - including UREA, Di-ammonium Phosphate (DAP), Muriate of Potash (MoP), and NPK will be marketed under Single Band Name.
  - ii. It aims to ensure timely supply of fertilizers as well as eliminate the dilemma of farmers in choosing one of the many brands available in the market.
- The scheme has also outlined the specifications of the new packaging for companies:
  - i. 2/3rd of the front will be covered by 'Bharat' brand and PMBJP Logo. 1/3rd of the space will be left for manufacturing brands.
- It will reduce the **logistic cost** involved in the transportation of fertilizers. It will stop crisscross movement of fertilizers for longer distance.

viii. **Pradhan Mantri Krishi Samridhhi Kendra (PMKSK)**

- It has been decided to convert the existing village/block/sub-district/taluk and district level fertilizer retail shop into **Model Fertilizer Retail Shops**. These shops will act as "**One Stop Shop**" for all the agriculture related inputs and services.

ix. **PM PRANAM (Proposed)**

- Aimed at reducing the use of chemical fertilizers and thus reducing the subsidy burden.
- **What is the need of this scheme? Drastic increase in overall expenditure of government on fertilizer subsidy.**
- The scheme will not have a separate budget and will be financed by the "savings of existing fertilizer subsidy" under the schemes run by the Department of fertilizers. Further, 50% subsidy savings will be passed on to the states that save the money as Grant. 70% of the grant provided under the scheme can be used for asset creation related to technological adoption of alternative fertilizers and alternate fertilizer production units at village, block and district levels.

## D) SOIL HEALTH CARDS (SHCS)

### - About the scheme

- » The international year of soils was celebrated in 2015 the same year India's unique program of soil health card was launched on 19th Feb to assess the nutrient status of every farm holding in the country.
- » It is a scheme administered by **Department of Agriculture & Cooperation** under the MoA&FW. It is being implemented through the Department of Agriculture of all the states and UT governments.
- » **The objective** of the scheme is to issue soil health cards to farmers every 2 years so as to provide a basis to address nutritional deficiencies in fertilization practices.
- » The SHCs carry crop-wise recommendations of nutrients and fertilizers required for the individual farms to help farmers improve the productivity through judicious use of input.
- » All Soil samples are to be tested in soil testing labs across the country.

### - Other Unique Features of SHC

- Collecting soil samples at a grid of 2.5 ha in irrigated area and 10 ha in un-irrigated areas.
- Uniform approach in soil testing adopted for **12 parameters** viz. primary nutrients (NPK); secondary nutrient (S); micronutrients (B, Zn, Mn, Fe & Cu); and other (pH, Electrical Conductivity & Organic Carbon) for comprehensiveness.
- **GPS enabled soil sampling** to create a systematic database and allow monitoring of changes in the soil health over the years.

## 5. CHEMICAL FREE AND NATURAL FARMING

### 1) ZERO BUDGET NATURAL FARMING

#### - Definition: What is ZBNF?

- ZBNF is a method of **chemical-free agriculture drawing from traditional Indian practices**. It is a set of agricultural methods which doesn't involve any credit, doesn't spend any money on purchased inputs (**zero budget**), uses very less water (10%), doesn't use any synthetic chemical fertilizer or pesticide (thus **natural**) and believes in natural growth of crops using inputs which are locally available.

#### - Subhash Palekar, the original promoter of ZBNF, identifies four important Pillars of ZBNF.

- Beejamrita/beejamrutha** is the **seed treatment using local cow dung, cow urine, lime and soil**. This protects young roots from fungus and soil borne or seed borne diseases.
  - Jivamrita/Jivamrutha** is a fermented microbial culture which is used as a **base fertilizer**. It is a fermented mixture of water, cow dung, cow urine, jaggery, pulse flour and a handful of soil from the bund of the farm. It provides basic nutrient, acts as catalytic agent to promote the activity of micro-organisms, and reduces fungal and bacterial infections.
  - Acchadana - Mulching** activities to ensure favourable microclimate in the soil. Three kinds of mulching has been suggested: **Soil Mulch**, **Straw Mulch** and **Live Mulch** (symbiotic intercrops and mixed crops)
  - Whapasa - Moisture:**
    - Palekar questions the idea that plant roots need a lot of water and therefore criticizes over reliance on irrigation in green revolution. According to Palekar, root needs water vapours.
    - **Whapasa is a condition where there is both air molecule and water molecule present in the soil** and thus Palekar encourages reducing irrigation, irrigating only at noon, and in alternate furrows.
- **In addition**, ZBNF includes three methods of insect and pest management: Agniastra, Brahmastra, and Neemastra (all different preparation using cow urine, cow dung, tobacco, fruits, green chilli, garlic and neem).
  - **ZBNF - a movement at grassroot level**
    - It has emerged as a grassroot peasant movement and has spread to various states in India, especially becoming very successful in southern states. This movement could be running among millions of farmers according to ZBNF leaders. This success have been achieved without any





formal movement organization, paid staff or even bank accounts. ZBNF has inspired a spirit of volunteerism among its peasant, who are the main protagonist of the movement.

- **Benefits of ZBNF**

- ZBNF has not only worked in agronomic terms. But, it has brought about a variety of social and economic benefits.
  - **Reduced Cost: Reduces Resource Utilization -> Higher income for farmers**
  - **Sustainability:**
    - **Seed Diversity**: Rather than standard GM crops, it promotes local variety of seeds, their conservation and reuse.
    - **Water Conservation**
    - **Biodiversity Conservation**: ZBNF encourages the planting of diverse crops, inter cropping, and maintaining natural habitats on the farm. This promotes biodiversity, preserves native species, and supports the ecosystem balance.
    - **Reduced Pollution and GHG emissions**: By avoiding synthetic chemicals in agriculture, ZBNF promotes soil conservation, reduces water pollution and also controls global warming.
  - **Food Safety** due to less chemical use
  - **Household Food Autonomy**, not dependent on MNCs for seeds and fertilizers
  - **Reduced Import Dependence** as India is a net importer of fertilizers
  - **Reduced Subsidy burden for government** -> More spending on other socio-economic sectors

- **Some Limitations**: Unscientific – fertility reducing in long run

## 2) ORGANIC FARMING SITUATION IN INDIA

- As per **ESI 2022-23**, India has **44.3 lakh organic farmers**, the highest in the world, and about 59.1 lakh ha area was brought under organic farming by 2021-22.
- **Area wise** Madhya Pradesh has the highest area under organic farming in India, followed by MHA and RAJ.
- **Sikkim** voluntarily adopted going organic, and the process of getting total cultivable land of 58,168 hectares under organic farming commenced at ground level in 2010.
  - It has become the first state in the world to be become fully organic.
- **States** like Tripura and Uttarakhand have also set up similar targets.

## 3) PARAMPARAGAT KRISHI VIKAS YOJANA (PKVY)

- **Introduction**
  - PKVY has been launched by GoI to support and promote organic farming and thereby improving soil health.
  - Encourage farmers to adopt eco-friendly concept of cultivation and reduce their dependence on fertilizers and agricultural chemicals to improve yield.
- **Clustered Approach**: The PKVY supports organic farming via cluster approach.
  - 50 or more farmers form a cluster having 50 acre land to take organic farming.



- Each farmer would be provided 20,000 Rs per acre in three years for seed to harvesting crops and to transport them to market.
  - Out of this 61% is provided directly through DBT for inputs bio fertilizers, bio-pesticides, organic manure, compost, vermi-compost, botanical extracts etc.

#### A) BHARTIYA PRAKRITIK KRISHI PADHATI (BPKP)

- BPKP is introduced as a sub-scheme of Paramparagat Krishi Vikas Yojna (PKVY) since 2020-21 for the promotion of traditional indigenous practices for encouraging all forms of ecological farming, including zero-budget natural farming.
  - The scheme focuses upon capacity building, training, handholding, and on-field demonstration of natural farming through champion farmers.
- The scheme mostly emphasizes on exclusion of all synthetic chemical inputs and promotes on-farm biomass recycling with major stress on Biomass mulching; use of cow-dung formulations; plant-based preparations and time to time working of soil for aeration.
- Under BPKP, financial assistance of Rs 12,200/ha is provided for 3 years for cluster formation, capacity building and continuous handholding by trained personnel, certification and residue analysis.
- So far, 4.09 lakh ha of land have been brought under natural farming in 8 states.

### 4) MISSION ORGANIC VALUE CHAIN DEVELOPMENT FOR NORTHEASTERN REGION (MOVCD – NER)

- It is a central sector scheme and a submission under National Mission for Sustainable Agriculture. It was launched by MoA&FW in the north-eastern states (including Sikkim) in 2015.
- Farmers are given assistance of Rs 25,000/ha/3 years for, organic inputs including organic manure and bio-fertilizers etc.
- The scheme also provides an end-to-end support to the farmers from farm to fork including quality production, effective postharvest management, value addition through processing and direct marketing linkages to national and international markets.
- It is also aimed at developing certified organic products.
- **Impact:**
  - During last five years, the scheme has covered 74,880 ha area.
  - Government now targets 1.0 lakh ha area under 200 new FPOs over a period of 3-year period. (2021-2024)

**Note:** North-eastern region is not part of PKVY, since a dedicated scheme, MOVCD-NER was launched.

### 5) ALLELOPATHY

- **Introduction**
  - » Allelopathy is a biological phenomenon by which an organism produces one or more biochemicals that influence germination, growth, survival, and reproduction of other organisms. These biochemicals are known as allelochemicals and can be released in air, water or soil. These may have beneficial or detrimental effects on target organisms and the community.

- It can play significant role in major cropping systems of irrigated agriculture:
  - » **Increase nutrient availability** which can improve crop yield.
    - For e.g. wheatgrass can produce allelochemicals that can improve the quality of crops.
  - » **Sustainable Agriculture:** Allelopathy can contribute to sustainable agriculture by reducing the need for chemical inputs (like herbicides) and enhancing biodiversity.
    - **Controlling Weeds:** For e.g. crop residue of rye when used as a cover crop in a no-till system, it releases allelochemicals and prevent growth of weeds.
    - **Pest and Disease Control:** For e.g. Marigolds produce several allelochemicals in their roots and leaves. They are often planted in gardens and agricultural fields to deter various pests.
  - » **Making Crop Rotation and Intercropping better:** Better understanding of allelopathy can help us understand which crops will benefits each other in case of crop rotation or inter-cropping.
  - » **Soil Health:** Allelochemicals can influence the soil microbial community, affecting nutrient cycling, and soil fertility. They may either enhance or reduce soil health, depending on the type of allelochemicals involved.
- **However**, it has to be understood that lack of understanding of allelopathy can lead to several negative impacts. For e.g. Negative allelopathy can reduce crop yield if crops are grown in sequence or in combination with plants that produce inhibitory chemicals. They may inhibit germination, growth or reproduction.
  - » For e.g.
    - Mustard produces a chemical called allyl isothiocyanate, which can inhibit the growth of some plants, such as tomatoes.
    - Peanuts produce a chemical called gossypol, which can inhibit the growth of plants like corn.

## 6. IMPORTANT FOOD CROPS AND PLANTATION CROPS

### 1) TEA

- **Introduction**
  - » Tea is the dried leaf of a bush. It contains theine (caffeine) and when added to boiling water along with sugar and milk, gives a stimulating drink. It is the most important beverage crop of India.
- **Institutional Arrangements**
  - » **Tea Board of India**
    - The Tea Board of India is a state agency of GoI established to promote cultivation, processing, and domestic trade as well as export of tea from India. It was established by the enactment of the Tea Act, 1953 with its headquarters in Kolkata.
    - **Functions**
      - Responsible for assignment of certification numbers to exports of certain tea merchants. This certification is intended to ensure the teas origin, which in turn

would reduce the amount of fraudulent labelling of rare tea such as ones harvested in Darjeeling.

- Endorsement of diverse production and productivity of Tea
- Financial support to research organizations
- Monitoring of advances in Tea packaging as it relates to health beneficial aspects
- Ensuring technical support for tea trade in global industry by coordinating with research institutes, tea trade and government bodies.

## - **Tea Cultivation**

### » **Requirements for Tea Cultivation**

#### ▫ **Climate:**

- » Tropical and subtropical climate endowed with deep and fertile well drained soil, rich in humus an organic matter.
  - A moderately hot and humid climate, which is preferred for better yield, crop distribution and quality.
- » Frequent showers evenly distributed over the years ensure continuous growth of tender leaves.

- **Temperature:** An ambient temperature within 13 degree Celsius and 28-32 degree C is conducive for growth of tea. Maximum ambient temperature above 32 degree C is unfavorable for optimum photosynthesis. Heat is synergically disastrous for the crop if it is accompanied by low humidity.

- **Winter Dormancy:** At temperature below 12 degree C, there is hardly any growth during this period. Flushing in the tea plant starts from March, with the rise in temperature.

#### ▫ **Soil**

- » Acidic soil with around 4.5-5.5 pH. Suitable soil for tea cultivation is well drained, deep, friable loamy soil. **The best soil for tea cultivation is forest soils rich in humus and iron content.**

#### ▫ **Other Requirements**

- Cheap and efficient labour as tea is almost exclusively hand picked.
- Tea grows better when planted along the shady tree.

## - **India's major Tea producing areas**

- The main tea growing regions are in Northeast India (including Assam) and in North Bengal (Darjeeling district and the Dooar region). Tea is also grown on large scale in Nilgiris in South India.
- **Assam:** Darrang, Goalpara, Kamrup, Lakhimpur, Dibrugarh, Nowgong, Sibsagar, Cachar, Karbi Anlong, North Cachar.
- **West Bengal:** Darjeeling, Terai (west Dinajpur), Doors (cooch bihar)
- **Tamil Nadu:** Kanyakumari, Tirunelveli, Madurai, Coimbatore, Nilgiris.
- **Kerala:** Cannanore, Palghat, Kozhikode, Malappuram, Trichur, Trivandrum, Quilon, Kottayam, Ernakulam, Idukki, Wayanad.
- **Karnataka:** Chikkamagaluru, Coorg, Hassan.
- **Himachal, Uttarakhand, Meghalaya, Andhra Pradesh, and Tripura** are also tea producing states in the country.

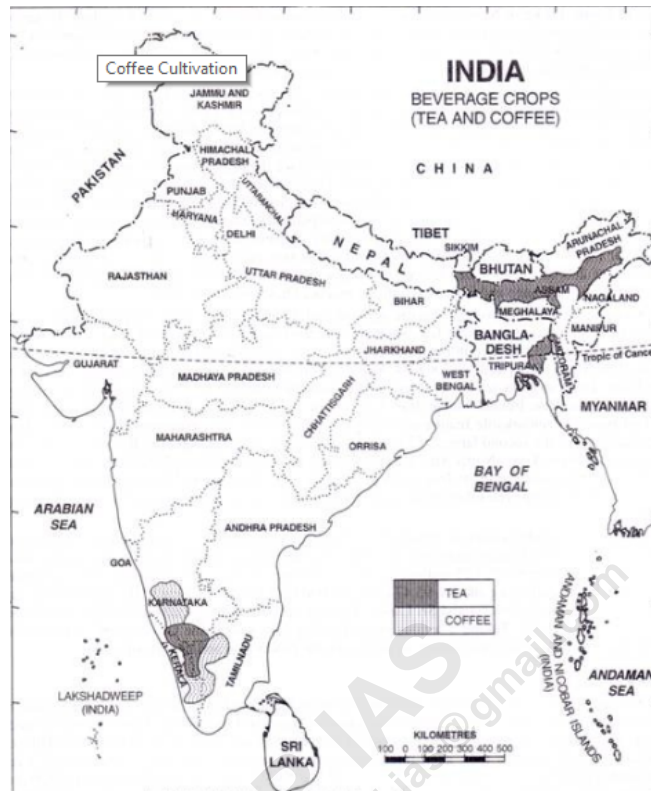
## - **Tea Consumption in the country**

- India is also one of the largest tea consumers in the world, without about 3/4th of the total production consumed in the country itself.
- **Exports**
  - India exports CTC (crush-tear-curl) grade mainly to Egypt, Pakistan and the UK, and the orthodox variety to Iraq, Iran and Russia.
- **Key problems faced by the Organized Tea Industry in the country**
  - **Scarcity of labor and its cost** (65% of the cost) in the organized industry
  - **Prices** have not increased in tandem with inflation.
  - **Emergence of the small tea growers** as a dominant force in the industry
    - Lately, the organized sector's production has shown a declining trend and small tea growers now have a larger share of the pie.
  - **Deteriorating quality due to aging tea bushes** in this centuries-old industry.
    - Till Sep 2019, around 3,325.7 hectares have been uprooted and replanted during the government's medium term framework (MTF-2017-20)

## 2) COFFEE

- **Introduction**
  - » Coffee is a tropical plantation crop. Its seeds are roasted, ground and are used for preparing beverage. In India, it is the second most important beverage crop, next only to tea.
  - » It is indigenous to Ethiopia. In India, Coffee plantations started in 18th century. Over the years, we have earned a distinct identity for our coffee. India is the only country in the world where coffees are grown under a 'well-defined two-tier shade canopy' of evergreen leguminous trees.
  - » There are three varieties of coffee i.e. **arabica, Robusta and liberica**. India mostly grows the superior quality coffee, arabica, which is also in great demand in the international market.
  - » India is one of the top 10 coffee producers in the world (generally ranked 5th or 6th) -> After Brazil, Vietnam, Columbia and Indonesia. We produce around 5% of the world coffee.
- **Total Production and Exports**
  - » India's coffee production is estimated in 2022-23 at 393,400 tonnes.
  - » India exports 80% of its production to more than 40 countries.
    - The exports reversed a COVID-induced slide to record a 42% year on year jump in 2021-22, exceed the \$1 billion mark for the first time.
- **State wise production.**
  - » Coffee plant was grown for the first time on Baba Budan Hills (Karnataka) in India.
  - » The three southern states account for almost all of the coffee production in the country with **Karnataka (71%)** being the largest producer followed by Kerala (21%) and Tamil Nadu (5%).
  - » In Karnataka, the **Kodagu and Chikkamagaluru** district account for over 80% of the state's total output.
- **Climatic Condition Requirements**
  - » Since coffee is a **tropical plantation**, it requires **hot and humid** climate with temperature varying between 15 degrees Celsius to 28 degree Celsius and a rainfall between 150-250 cm.

- » It grows on the hilly slopes at the height of 900-1800 m. These conditions are prevalent in the hill areas of Nilgiris where the coffee plantations are mostly confined.
- » **Dry weather** is necessary at the **time of ripening of the berries**.
- » It **doesn't tolerate** frost, snowfall, high temperature above 30 degree Celsius and strong sun shine and is generally grown under shady trees.
- » **Cheap and skilled labor force** is another requirement for coffee cultivation which is required in sowing, transplanting, pruning, drying, grading and packing of coffee.



### 3) PULSES

- **Intro**
  - » Pulses are the important source of proteins, vitamins and minerals and are popularly known as "Poor man's meat".
- **Advantages Positives about Pulses**
  - » Nutritional Security
  - » Suitable for Marginal Environment
  - » Increase fertility of Land
  - » Low food wastage footprint
- **Various pulses and production in India.**
  - India is the **largest producer** (25% of global production), **consumer** (27% of world consumption) and **importer (14%)** of pulses in the world.

- They account for 20% of India's total area under cultivation and provide 7-10% of the total food grains in the country.
- **The overall pulse production in India** has gone up from **8.4 million tonnes** in 1950-51 to **27 million tonnes** in 2022-23.
  - » In fact, in the last decade, India's production has increased by 50% (from 18 million tonnes to 27 million tonnes)
  - » But pulse production has not increased in step with the population growth, per capita availability of pulses have **declined from 22.1 kg per person in 1951 to 16.4 kg per person in 2022**.
  - » Though there is surplus production of Chana, the imperfect substitution among pulses and limited international availability put pressure on the prices of some pulses.
- **Main Crops:**
  - » **Bengal Gram** (Desi Chick Pea/ Desi Channa), **Pigeon Peas** (Arhar/ Toor/ Red Gram), **Green Beans** (Moong Beans), **Chick Peas** (Kabuli Chana), **Black Matpe** (Urad / Mah / Black Gram), **Red Kidney Beans** (Rajma), **Black eyed Peas** (Lobiya), **Lentils** (Masoor), **White Peas** (Matar) are major pulses grown and consumed in India.
  - » **Rabi Crops (60% Production Share):** Gram, Peas, lentil (masur), and black gram
  - » **Kharif Crops (40% Production Share):** Arhar(tur), Moong and Urad etc.
  - » **Gram** (with 50% share) is the most dominant pulse produced and consumed in India. it is followed by **Tur/Arhar (15-20%)** and **Urad & Moong (8-10%)**.
    - **Note:** Experts say that Tur's consumption in meals as dal is much more than that of Chana. Chana is used more on account of its use in packaged food.
  - » **Gram** is the crop of subtropical areas. It is a rainfed crop.
  - **Major Pulse Producing States:**
    - Madhya Pradesh, Maharashtra, Rajasthan, UP, and Karnataka.
- **Primary reasons for domestic shortage of pulses and reduction in per capita availability of Pulses in India** are:
  - A. **The increase in area under cultivation, production and productivity of pulses has been extremely slow.**
  - B. **Low Yield, increased irrigation facilities and Blue Bulls trouble**
  - C. **Open ended procurement of wheat and rice under MSP -> Lack of assured price for pulse**
  - D. **Very less R&D on pulses globally** (due to very less consumption in advanced western countries)
- **Steps which have been taken to increase pulse production.**
  - A. **Measures to incentivize Pulse Production** under **National Food Security Mission (NFSM), Minimum Support Price Programs and by Increase production.**
    - For e.g. PM AASHA's prize support scheme specifically focused on increasing the procurement of pulses on MSP.
  - B. **Crop Diversification Program** (a sub scheme of RKVY) is being implemented in original green revolution states viz. Punjab, Haryana, and in Western Uttar Pradesh to diversify paddy areas towards less water requiring crops like oil seeds, pulses, coarse cereals, agro forestry etc.



## 4) MILLETS

- **International Year of Millet (IYM):** The United Nations General Assembly has declared the year 2023 'International Year of Millets'. It will help in creating awareness throughout the world about the significant role of millets in sustainable agriculture and its benefits as a smart food and superfood.
- IYM 2023 aims to contribute to the UN 2030 Agenda for Sustainable Development, particularly SDG 2 (Zero Hunger), SDG 3 (Good health and well-being), SDG 8 (Decent work and economic growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate action) and SDG 15 (Life on Land)



- **Definitions:**
  - Millets include Jowar, Bajra, Ragi, little millets including Kutki, Kodo, Sawa, Kangni and Cheena.
- **Cropping:**
  - They are generally cultivated in low-fertile land, mountains, tribal and rain-fed areas.
    - These areas include Andhra, Chhattisgarh, Gujarat, Haryana, MP, Rajasthan, MHA, KAR, UP, TN and Telangana.
  - India is the **largest producer and second largest exporter of millet** and in 2022 India produced around 50.9 million tonnes. This accounts for 80% of Asia's and 20% of global production. India is followed by African countries like Nigeria and Niger in production.
- **Decreased Production over the years:**
  - In pre green revolution era (1965-66), millets were cultivated in 36.90 million hectares of the country. In 2016-17, the area reduced to 14.72 million hectares.
    - **Why?**
      - **Green Revolution** increased the productivity of wheat and rice.
      - Expansion in irrigation.
      - MSP Policy
      - **Changes in consumption pattern, dietary habits etc:** Socio-economic dynamics resulting from the hardy nature of the crop, relegated them to be the grain of the poor.
- **But recent studies** have highlighted various significance of millets for healthy life and sustainable economic development:
  - » **Agri-Sustainability:**



- **Climate Resilience:** Millets are tolerant to droughts, intensive to excess sunlight etc.
- **Water Efficient:** Millets can survive in less water conditions and can solve the problem of over-extraction of water resources.
  - A new study published in the journal ***Nature Water*** in Oct 2023 highlights that shifting to millets increases groundwater recharge more than drip irrigation in India's northern plains.
- » **Better Health:**
  - **Food Security:** In arid areas, millets are often the only crops that can be harvested in the dry regions and are a crucial part of household food basket.
  - **Nutrition:** Millets are smart food which are rich in nutrients like protein, vitamin-A, iron, calcium, iodine etc.
    - For e.g., just 100 gm of daily cereals (rice) intake with finger millets (ragi) will increase the daily iron intake by 50% and calcium by 350%.
- **Government Initiatives to promote Nutri-Cereals:**
  - » **Union Budget for FY24** announced an initiative focused on '**Making India a Global Hub for Millets**' (Shree Anna).
    - The Indian Institute of Millet Research, Hyderabad, will be supported as the Centre of Excellence for sharing the best practices, research and technologies at the international level.
  - » **MAHARISHI Initiative** i.e. Millets and OtHer Ancient Grains International ReSeArch initiative. This international initiative will focus on research and awareness via agro-biodiversity, food security and nutrition aligning with the International Year of Millets.
  - » **India had declared year 2018 as the Year of Millets:**
    - Spreading **awareness** about nutritional benefits of nutrients which will help in increasing the demand resulting in remunerative prices for poor and marginal farmers.
  - » Under the **Sub Mission on National Food Security Mission (NFSM) - Nutri Cereals** is creating awareness among farmers for Nutri Cereals (Millets).
    - NFSM - Coarse Cereals are divided into two components
      - NFSM (Makka and Jau)
      - Sub Mission on Nutri-Cereals covering Jowar, Bajra, Ragi and little millets like Kutki, Kodo, Sawa, Kangni and Cheena

## 5) OILSEEDS – NEXT CLASS