

TARGET PRELIMS 2024

BOOKLET-22; ECONOMY-3

AGRICULTURE AND RELATED ISSUES-2

1. TABLE OF CONTENTS

2. OilSeeds	2
1) About Palm Oil	3
2) National Mission on Edible Oil - Oil Palm (NMEO-OP) aims to reduce some of the above challenges.....	5
3. Cotton Production	6
1) Problem of Development of Resistance in pests such as Pink Boll Worm (PBW)	7
4. Horticulture	8
1) Total Production.....	8
A) Scheme: Horticulture Cluster Development Program (CDP)	9
B) Mission for Integrated Development of Horticulture (MIDH)	9
C) Project CHAMAN (Coordinated Horticulture Assessment and Management Using Geo-Informatics)	10
D) Atmanirbhar Horticulture Clean Plant Program	10
2) Some Individual Crops	10
A) Onion	10
B) Tomato.....	11
C) Cucumber Mosaic Viruse and Tomato Mosaic Virus (July 2023)	12
3) Spices	13
A) Spice Board of India	13
B) TURmeric and Turmeric Board	14
4) Lotus – NAMOH 108	14
5. Farmer Producer Organization (FPOs)	15
6. Special Agriculture Practices and Advantages	15
1) Crop Diversification	15
2) Integrated Farming System.....	17
3) Precision Agriculture	17
4) Multilayered Farming	18
7. Next CA Booklet	19

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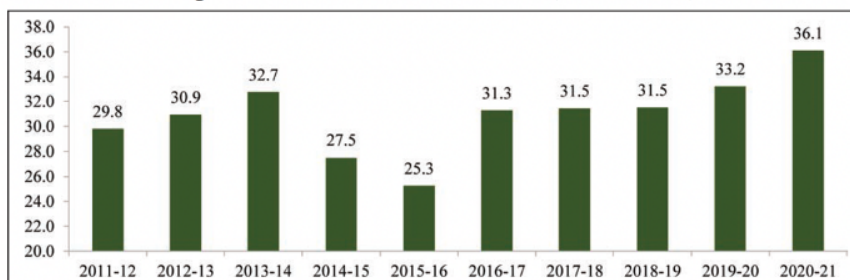
2. OILSEEDS

- Area under Oilseeds cultivation has increased from 10.7 million hectares in 1950-51 to **28.8 million hectares in 2020-21**. The **production of Oilseeds** has also increased to 36.1 million tonnes in 2020-21. But, even now, **India imports majority of its edible oil consumption**.

» As of 2019-20, India produced 7.9 million tonnes of oil and imported 13.4 million tonnes of oil. This makes India the **largest importer and second largest consumer of edible oil** in the world.

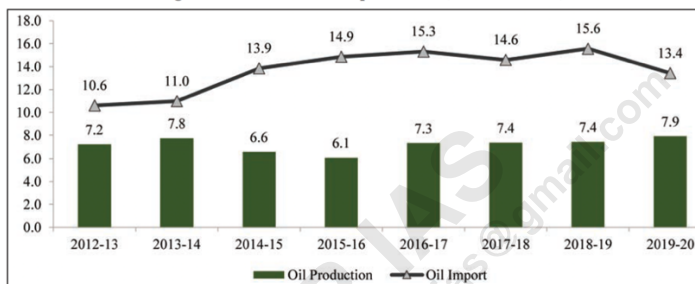
- India is one of the major oilseeds growing country in the world. The production was fluctuating earlier, but since 2016-17 it has continuously grown. The production has increased to **36.1 million tonnes in 2020-21** which is 43% higher than the 2015-16 production.

Figure 7: Trend in Production of Oilseeds (Million Tonnes)



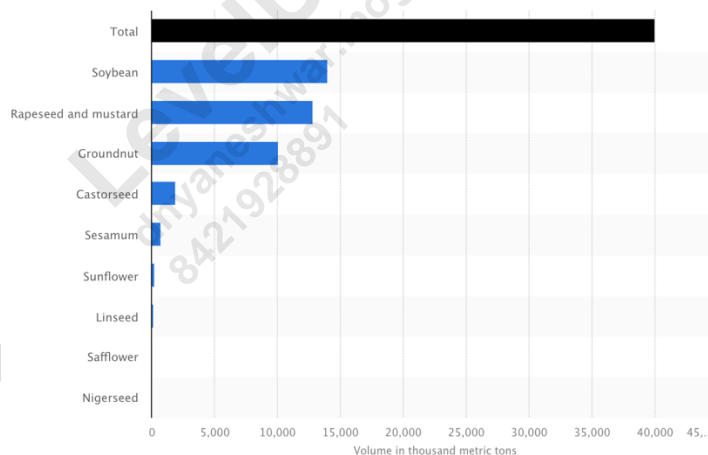
Source: Based on data of 4th Advanced Estimates as on Directorate of Economics & Statistics Website.

Figure 8: Production & Import of Oil (Million Tonnes).



Source: Based on data of Agricultural Statistics at Glance, 2020.

- **Production of oilseeds in India in 2023 (in 1,000 tonnes)**



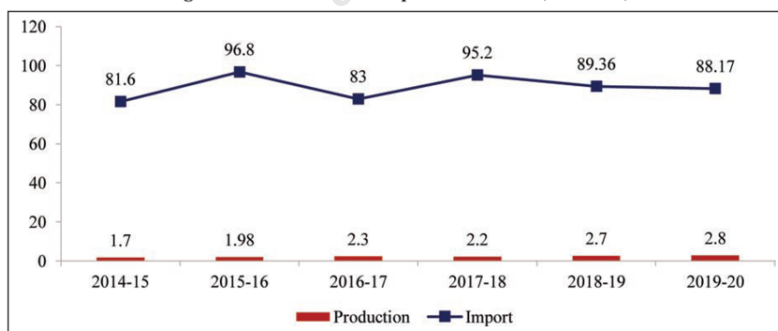
- **Reasons for Low Oil Seeds Production in India:**

- » **More Focus on Wheat and Rice:** Green Revolution, MSP Regime, High Yielding Varieties etc.
- » **Productivity and yield of oilseeds crop is low.**

- **Palm** oil which has high productivity hasn't grown in India
 - Lack of access to **improved variety of seeds** (for e.g. GM varieties like DMH-11 are still not allowed to be grown commercially).
 - Specialized inputs like specific fertilizers, pesticides etc. are not easily available.
- » **Poor Infrastructure:** Inadequate irrigation facilities
- **Government Initiatives** to reduce the import dependency has been focused on increasing the production and productivity of oilseeds:
1. **Improving the Seed Varieties: National Food Security Mission – Oil Seeds (NFSM-Oilseeds)**
 - » A centrally sponsored scheme
 - » Focused on **production of foundation and certified seeds** and **distribution** of certified seeds and seeds mini kits of latest high yielding varieties.
 - » Under NFSM-Oilseeds, government of India has set up **36 oilseeds seed hubs** during 2018-19 and 2019-20 with an **objective to increase the availability of high yielding quality seed**.
 2. **Incentivization of oilseeds through MSP regime.**
 3. **National Mission on Edible Oils – Oil Palm (NMEO-OP)** aimed at increasing availability of edible oil in the country by harnessing area expansion and through price incentives.
 4. **Asian Palm Oil Alliance (APOA): 5 Major Palm Oil Importers from Asia form alliance (Sep 2022)**
 - » The **apex edible oil industry associations** from five major palm oil importing countries of Asia - **India, Pakistan, Sri Lanka, BD, and Nepal** - have come together to form the Asian Palm Oil Alliance (APOA), at the instance of Solidaridad Network, a specialist in sustainable agriculture. The purpose is to safeguard the economic and business interests of the palm-oil consuming countries.
 5. **Atmanirbhar Oil Seed Abhiyan** (announced in Budget 2024-25)
 - » Under this a strategy will be formulated to achieve 'Atmanirbharta' for oil seeds such as mustard, groundnut, sesame, soybean, and sunflower. The initiative will focus on research for high-yielding varieties, widespread adoption of modern farming techniques, market linkages, procurement, value addition, and crop insurance.
 6. Other steps like Pradhan Mantri Krishi Sinchayi Yojna, MSP for Oil seeds, subsidies for inputs such as fertilizers and pesticides, Training and extension programs for farmers etc. also help oil seed sector.

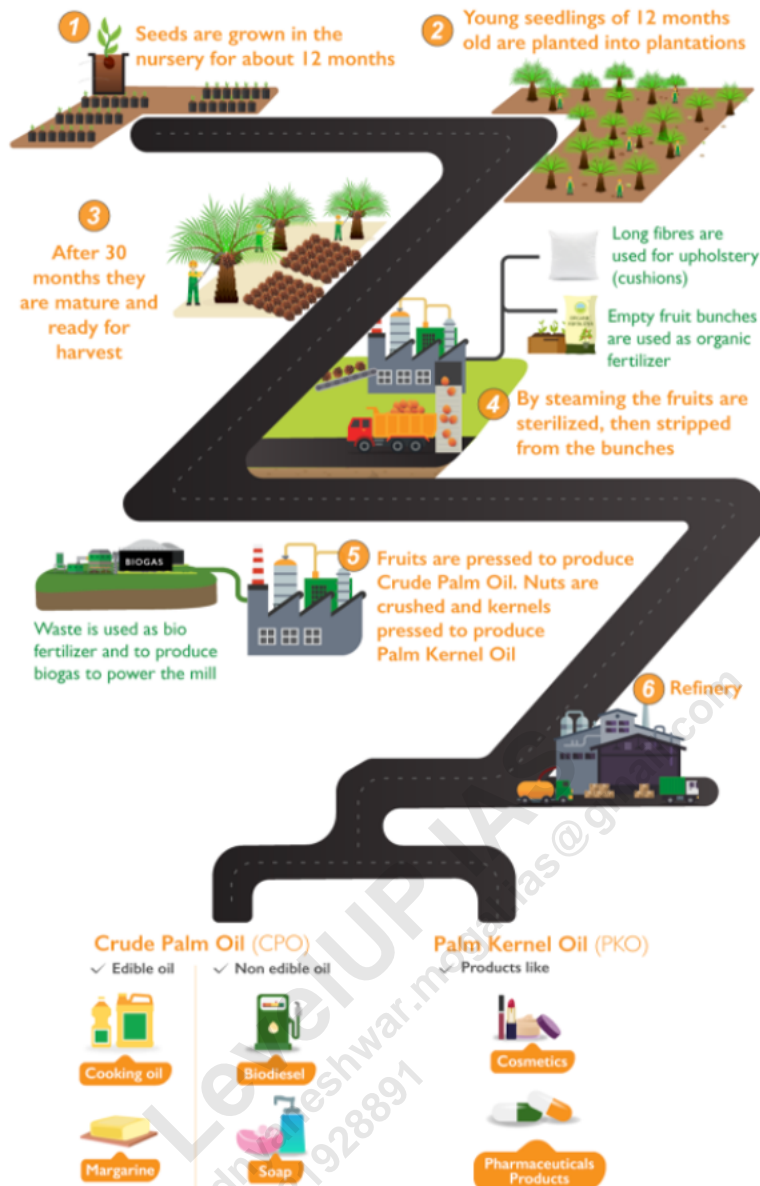
1) ABOUT PALM OIL

Figure 9: Production and Import of Palm Oil (Lakh Ton)



Source: Based on data of Agriculture Statistics at Glance, 2020 and DAFW.

HOW PALM OIL IS MADE



- Oil Palm Cultivation in India has significant potential due to following reasons:

1. **Increasing Demand of vegetable Oil**
2. **Agro-Climatic Conditions:** Oil Palm can be grown in tropical and subtropical climates of India. Regions like Tamil Nadu, Kerala, Karnataka, and North-eastern India are well suited for palm oil cultivation.
3. **Potential to reduce India's import dependency:** Of all the vegetable oils imported in India, Palm oil constitute around 60%.

4. **High Yield of palm oil:** It produces 10 to 46 times more oil per hectare compared to other oilseed crops.
5. **Other value-added products** - Other than cooking oil, Palm Kernel oil is used in cosmetics and pharmaceutical products.
6. **Increased economic opportunities and Jobs**

- **However**, introduction of largescale oil palm cultivation has also been associated with some challenges:
 1. **Deforestation and biodiversity loss:** Indonesia has seen large scale deforestation and biodiversity loss to expand oil-palm cultivation.
 2. **High Initial Cost:** The oil palm tree takes 3-4 years to mature and start producing oil palm. This can be barrier for most Indian farmers.
 3. **Price Fluctuation** is also a major concern which limits the scope of
 4. **High Irrigation requirement** is another challenge
 5. **Shortage of planting material.**

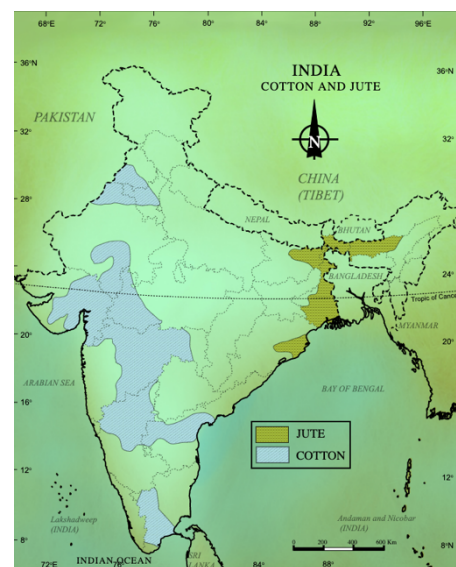
2) NATIONAL MISON ON EDIBLE OIL - OIL PALM (NMEO-OP) AIMS TO REDUCE SOME OF THE ABOVE CHALLENGES.

- » Launched as part of Atmanirbhar Bharat Scheme, **it aims to expand India's oil palm cultivation from around 3.5 lakh hectares to 10 lakh hectares** in a phased manner. It also targets to increase crude oil production **to 11.2 lakh tones by 2025-26 and upto 28 lakh tonnes by 2029-30.**
- » **Budgetary allocation** - Rs 11,040 crores (of which Rs 21,96 crore will come from states)
- » **To tackle High Initial cost**, a substantial increase in assistance for inputs/interventions has been made :
 - For Planting Materials for oil palms, a substantial increase from Rs 12,000/ha to Rs 29,000/ha has been made.
 - Substantial increase has been made for maintenance and intercropping interventions -> A special assistance @Rs 250 per plant is being given to replant old gardens for rejuvenation of old gardens.
- » **To tackle price fluctuation**, government is also providing **price assurance to palm oil farmers** for the fresh fruit bunches. This is called **viability price**. It will protect farmers from price fluctuations in international market.
 - The VP will be annual average CPO price of the last five years adjusted to WPI Index, multiplied by 14.3%.
 - There is a sunset clause for the scheme which is 1st Nov 2037.
 - The Scheme will have special focus on north-east region and the **Andaman and Nicobar Islands**.
 - To give impetus to the NE region and Andaman, the government will additionally bear a cost of 2% of the CPO price to ensure that the farmers are paid at par with the rest of India.
- » To address the issue of shortage of Planting Material in the country, **seed gardens will be provided assistance upto Rs 80 lakhs for 15 ha** in rest of India and Rs 100 lakhs per ha in NE India and Andaman region.

- » **For Environment sustainability** NMEO advocates responsible cultivation practices that align with India's **National Biodiversity Action Plan**. It also has provisions for investment in R&D for the development of drought resistance varieties.

3. COTTON PRODUCTION

- Cotton is one of the principal commercial crops of India and India accounts for around 25% of the total global cotton production. It plays a major role in sustaining the livelihood of an estimated 6 million cotton farmers and 40-50 million people engaged in related activity such as cotton processing & trade.
 - » Due to its economic significance, in India, it is also termed as "**White Gold**".
 - » **India is the largest producer and consumer of Cotton** in the world. Adoption of Bt Cotton in 2000s enabled significant increase in cotton production from 10 million bales in 2001-02 to 34.3 million bales in 2022-23.
 - » It is an indigenous crop which is sown as Kharif Crop in semi-arid region of the country. It takes 6-8 months to mature.
- **Suitable Climate Condition for Cotton**
 - » Cotton is a crop of tropical and subtropical areas and requires uniformly high temperatures between **21 degrees and 30 degrees C**. The growth is negatively impacted if the temperature falls below 20-degree C. **Frost** is harmful for the crop.
 - » The crop has modest water requirement (average annual rainfall of **50-100 cm**) and can be grown in areas with lower rainfall with the help of irrigation.
 - » **Good sunshine** is a must at the time of flowering and moist weather or heavy rainfall at the time of ball opening and picking are detrimental to the crop.
- **Other requirements**
 - » Cheap and skilled labor force at the time of picking of cotton. Normally the picking season is spread over a period of 3 month.
- **Traditionally**, it is cultivated on the **lava plateau of Deccan** and therefore the soil here is called the **Black Cotton soil**.
- **In Tamil Nadu**, it can be grown both in Kharif and Rabi season as there is no threat of frost which is dangerous for the cotton production.
- **Total Production and Distribution of Cotton Cultivation in India:**
 - » India has the world's highest area under cotton cultivation which accounts for around **6% of the net sown area**.
 - » India also produces **51%** of the total organic cotton production of the world, which demonstrates India's effort towards sustainability
 - » There are **three major cotton producing regions** in India:
 - Northern Zone:** Southeast Punjab, Western Haryana, and Northern Rajasthan
 - Central Zone:** Gujarat, Maharashtra, Western Madhya Pradesh and neighboring Southern Rajasthan in Western India
 - Southern Zone:** Telangana, Andhra Pradesh, North Karnataka and Tamil Nadu



- **Initiatives:**
 - » **Budget 2023-24:**
 - To enhance productivity of extra-long staple cotton, we will adopt **a cluster based and value chain approach through Public Private Partnerships (PPP)**.
This will mean collaboration between farmers, state and industry for input supplies, extension services, and market linkages
- **Various types of cotton grown in India:** Three broad types of cotton are generally recognized on the basis of length, strength, and structure of the fiber.
 - a. **Long Staple Cotton**
 - Cotton with longest fiber (24 to 27 mm)
 - Fine and shining quality, used for superior quality of clothes.
 - About 50% of the cotton produced in the country is long stable type.
 - b. **Medium Staple Cotton**
 - Length of the fiber (20 to 24 mm)
 - c. **Short staple cotton**
 - Inferior cotton with less than 20 mm length. Used for making inferior cloth and fetches less price.

1) PROBLEM OF DEVELOPMENT OF RESISTANCE IN PESTS SUCH AS PINK BOLL WORM (PBW)

- **Background:** Indian farmers have faced consistent loss of Bt Cotton crops due to pink bollworm attacks since the mid-2000s, when scientists found that the insect had became resistant to the genetically modified variety of cotton.
 - » **About PBW:**
 - PBW is a worm that destroys parts of the developing cotton fruit, such as the square (flower bud) and the boll (rounded sac of seeds with cotton fibres).
 - Adult worms are thin grey moths that lay eggs on buds, flowers, and bolls. The larvae hatch from the eggs and burrow into the bolls to feed on the seeds. It cuts through the lint and stains it in the process, resulting in a loss of quality
 - » Bt Cotton was encoded with Cry1Ac toxin which protected it from all three species of bollworms (American, spotted, and pink bollworm)
 - Later, Cry2Ab gene was also added in Bt Cotton to improve protection against the American Bollworm.
 - » But, in 2008, scientists in India found unusual survival of Pink bollworm in Amreli district of Gujarat, indicating of Pest's resistant to Bt cotton.
 - By 2014, it was clear that Pink Bollworm had become resistant to both Cry1Ac toxin as well as Cry2Ab toxin.
 - **PBW** is more dangerous than American Bollworm as it feeds from inside the bolls and thus remains elusive in the initial stages and is seen in harvest stages when the damage is already done. As it feeds from inside, no amount of pesticide help control it.
- **How was resistance developed by PBW: Key Factors:**

- » **Early Sowing and Late Sowing:** The ideal time for sowing cotton is April 15 to May 15. But many farmers in the northern belt of Haryana, Rajasthan and Punjab have started sowing from March end or the first week of April and extend it up to June end, which is an increase from 45 days to 80 days.
 - The early sowing season coincide with the time the PBW comes out of hibernation or the diapause stage in the winter months. The pest survives in this stage between two cotton seeds or cotton crop residue.
 - The cotton plants are at bud or flowering stage, during which the PBW searches for food and begins feeding on bolls during the larval stage, which continues for 14-17 days. It eventually starts laying eggs.
 - The issue worsens for farmers who sow late. The process enables worms to access food for longer periods and increasing generations.
- » The **longer duration of cotton varieties** in the south and central India, which lasted upto 150-160 days, helped the pest develop resistance to the genetically modified varieties.
- » **Not Planting other varieties against Advice:** Farmers were repeatedly advised to plant indigenous, hybrid varieties of cotton alongside Bt to prevent developing resistant. "The crossbreeding of pests from different varieties of plants would have prevented developing tolerance for longer years". But farmers haven't followed the advice.
- **Cotton Crops across the North-Indian States**, Punjab, Haryana, and Rajasthan, are reporting a severe pink bollworm attack and even Bt-Cotton is falling prey to the pest it was created to resist. (Oct 2023)
- **Impact:**
 - **Damage to crops:** Damage in 2023, is the highest since 2001 - both according to government and farmers.
 - **Note:** Before 2001, the American bollworm created havoc and ruined lives of farmers.
 - **Difficult to find laborers:** As laborers refuse to pick leftover crop as yield is too low
 - **Difficult to find buyers** as traders refuse to buy citing poor quality.
 - **Farmer Suicide:** In Sep 2023, Sri Ganganagar district saw first farmer suicide in over a decade. It was due to the fact that farmer had a lot of debt accumulated due to loss of cotton crop consecutively for 3 years.
 - **Farmers giving up cotton cultivation** in the northern belt (for e.g. the production of cotton in Punjab has almost halved in the past decade).

4. HORTICULTURE

1) TOTAL PRODUCTION

- Horticulture sectors comprise a wide array of crops from fruits and vegetables to nuts, spices, medicinal plants, flowers, and plantation crops, provides many opportunities for income generation.

Total Horticulture	2021-22 (Final)	2022-23 (First Adv. Est.)	2022-23 (Second Adv. Est.)
Area (in million hectares)	28.04	28.28	28.12
Production (in million tonnes)	347.18	350.87	351.92

- **Globally**

- » India is the **2nd largest producer of fruits and vegetables**. China is the largest vegetable producer, but it produces four times that of India. It shows that India has a long way to go in terms of vegetable production.
- » India is the **largest producer of mango, banana, coconut, cashew, papaya and Pomegranate**.
- » India is also **largest producer and exporter of spices**.

A) SCHEME: HORTICULTURE CLUSTER DEVELOPMENT PROGRAM (CDP)

- It is a central sector program implemented by the National Horticulture Board (NHB) of the Ministry of Agriculture and Farmers' Welfare.
- It aims at **growing and developing horticulture clusters** to make them globally competitive.
 - Total **53 clusters** have been identified for the program, but initially in pilot phase, the CDP would be implemented in **12 clusters**. Later, based on learning from the pilot phase, the program would be extended to all 53 clusters.
- The program is designed to leverage the geographical specialization and promote integrated and market led development of horticulture clusters.
- It will address all major issues related to Indian horticulture sector including pre-production; production; post-harvest management; logistics; marketing and branding.
- **Expected benefits:**
 - » Benefit 10 lakh farmers; improve exports of targeted crops by at least 20%; create a cluster specific brand for better recognition and competitiveness of cluster crops; attract investment of around 10,000 crores when implemented in all 53 clusters.
 - » The **Clusters of the pilot phase** include Shopian (J&K) and Kinnaur (H.P) for Apple; Lucknow (UP), Kutch (Gujarat) and Mahbubnagar (Telangana) for Mango; Anantapur (A.P.) and Theni (T.N.) for Banana, Nasik (Maharashtra) for Grapes, Siphahijala (Tripura) for Pineapples, Solapur (Maharashtra) and Chitradurga (Karnataka) for Pomegranate and West Jaintia Hills (Meghalaya) for Turmeric.
 - » These clusters will be implemented through Cluster Development Agencies (CDAs) which are appointed on the recommendations of the respective State/UT Government.
- The program will **converge with other initiative of the Government** such as the Agriculture Infrastructure Fund (AIF) which is a medium - long term financing facility for investment in projects for post-harvest management of infrastructure and community farming assets and will leverage the central sector schemes of the Ministry for Formation and Promotion of 10,000 Farmers Producer Organizations (FPOs).

B) MISSION FOR INTEGRATED DEVELOPMENT OF HORTICULTURE (MIDH)

- All erstwhile schemes (National Horticulture Mission (NHM), Horticulture Mission for North East and Himalayas (HMNEH), National Horticulture Board [NHB], Coconut Development Board [CDB], Central Institute for Horticulture, and National Bamboo Mission [NBM] have been **subsumed under MIDH during the 12th Plan**.
- MIDH was introduced in 2014-15.
 - » The interventions include introducing improved varieties and quality seeds, incentives for plantation crops, cluster development, and post-harvest management.

- » According to third advance estimates (2021-22), a record production of 342.3 million tonnes in an area of 28.0 million hectares was achieved.
- » The government has identified **55 horticulture clusters**, of which 12 have been selected for the Cluster Development Programme (CDP) pilot phase. This programme is designed to leverage the geographical specialisation of horticulture clusters and promote integrated and market-led development of pre-production, production and post-harvest activities, including the entire supply chain.
- **Capacity Building of Farmers** by organizing them in **farmer producer Organization [FPO]/ Farmer Producer Companies [FPC]** is an added feature of MIDH.

C) PROJECT CHAMAN (COORDINATED HORTICULTURE ASSESSMENT AND MANAGEMENT USING GEO-INFORMATICS)

- Launched in 2014 under MIDH.
- Here remote sensing technology is used for generating action plan and strategic development of horticulture sector as also to increase the farmer's income.
- It is being implemented by the Delhi based **Mahalanobis National Crop Forecast Centre (MNCFC)**.
 - » It helps in identifying right crop for right weather conditions; methods for calculating reliable estimates; creating digital inventory; identifying areas of high post harvest losses etc.
 - » It helps in **managing inflation by giving correct estimates** of agri-products.

D) ATMANIRBHAR HORTICULTURE CLEAN PLANT PROGRAM

In order to promote the availability of disease free, quality planting material of high value horticultural crops, Government has initiated “Atma Nirbhar Clean Plant Programme” at an **estimated cost of Rs.2200 crore for a period of 7 years (2024-30)** with 50% assistance from Asian Development Bank (ADB).

The objectives of Atma Nirbhar Clean Plant Programme are:

- i. To enhance yield of horticulture crops by providing disease free planting material, dissemination and adoption of climate resilient varieties.
- ii. To protect ecosystem through proactive virus and disease control measures by establishing Clean Plant Centres (CPCs).
- iii. To enhance stakeholder capacities for the adoption and operation of clean plant production, maintenance, and distribution.
- iv. To improve the knowledge network among research institutes, universities, knowledge centers, national and state agencies for sustainable operation of clean plant centers and nursery certification programs.

2) SOME INDIVIDUAL CROPS

A) ONION

- India is the second largest producer of onion (19.9% of world production) after China.
- In India, Maharashtra(around 32%) is the largest producer of onion followed by Karnataka, Madhya Pradesh and Gujarat.

- The district of Nasik (around 40% of MHA production) of Maharashtra is famous for production of onion.
- India has three onion crops a year
 - Early kharif: (onion comes to market between October and December)
 - Late Kharif (rangda): Crop arrive between Jan and March
 - Rabi Crop: available for sale from April to May

B) TOMATO

- Introduction

- » Among the vegetables consumed in India, Tomato ranks 3 after potato and Onion, but globally it is the 2nd most consumed vegetable after Potato.
 - Note: Botanically, tomatoes fit the definition of fruit as they form from a flower and contain seeds.
- » In terms of area under tomato cultivation and in terms of total production, India ranks 2nd in the world.
 - The major tomato producing countries in the world are China, India, USA, Turkey and Egypt.

- About Tomato production in India

- » **India's total tomato production** is around 20 million tonnes. It peaked in 2019-20 at 21.187 million tonnes and has been **declining since**. The production in 2021-22 dropped to 20.69 MT and 20.62 MT in 2022-23.
- » It is typically a 90-100 day crop that starts yielding fruits 60-70 days after transplantation.
 - The seeds are first sown in nursery beds to raise seedlings that are transplanted in fields after around 25 days.
 - Production happen in flushes.
- » There are two major crops of tomato annually - Kharif and Rabi.
- » There are two main crops of tomato grown in the country.
 1. The first one transplanted from around mid-June in Central and South India (places such as Shivpuri, Sagar in **MP**, Nasik In **MHA**, Madanapalle in **AP**, Kolar and Mysore in **Karnataka** and Dindigul in **TN**) and mid-July to Aug in North India (Jhalawar and Jaipur-chomu belt in Rajasthan; Sonabhadra, Varanasi, Lucknow, Bareilly and Agra in Uttar Pradesh) and stretching to end of Sep in Eastern India (Purulia in West Bengal, Buxar in Bihar and Ranchi in Jharkhand)
 - The autumn to late kharif crop supplies the market from Sep onwards. This along with a smaller rabi crop transplanted during October-November, contributes to the familiar low tomato prices through the winter.
 2. The second main crop is transplanted during January-February. This is a longer duration crop typically taking 130-150 days, yielding an average of 25 tonnes per acres.
 - This is the **summer tomato** as it is harvested during May-July is grown mostly in regions where maximum temperature don't go beyond the mid-to-late thirties range during the flowering and fruiting season.

- » Such conditions are mostly found in relatively cool or hilly areas such as Madanapalle, Mysore, Kolar in Karnataka; Sangamner and Narayangaon in Maharashtra, or **Solan and Mandi in Himachal Pradesh**.

- **Why increase in Prices:**

» **Dip in overall tomato production due to:**

- Lower acreage of tomato**
- Extreme Weather Conditions**
 - Heatwaves and High temperatures** in April and May along with delayed Monsoon showers in southern India and Maharashtra led to attack on tomato crops.
 - Farmers in Maharashtra have said their tomato crop was impacted by attacks of the Cucumber Mosaic Virus (CMV) and growers in Karnataka and other South Indian States have blamed the Tomato Mosaic virus (ToMV) for crop loss.
 - Later, incessant rains in tomato-growing regions further affected the new crop and also made transportation to non-growing regions difficult.
- Low commercial realization of the crop for farmers** in the months of June as well as the last year.
- Seasonal Fluctuation:** July and August are the lean tomato production.

- **Other general challenges:**

- » Perishability of tomato is much higher than Onion and Potato.
- » Supply chain issues in transporting the vegetable from areas where it is grown to regions where it is not compounds the problem.

C) CUCUMBER MOSAIC VIRUSE AND TOMATO MOSAIC VIRUS (JULY 2023)

- Farmers in Maharashtra have said their tomato crop was impacted by attacks of the Cucumber Mosaic Virus (CMV) and growers in Karnataka and other South Indian States have blamed the **Tomato Mosaic virus (ToMV)** for crop loss.
- The two plant pathogens have similar names and cause similar damage to crops, but they belong to different viral families, and spread differently.
- **About Tomato Mosaic Virus (ToMV):**
 - » It belongs to **the Virgaviridae** family and is closely related to **the Tobacco Mosaic Virus (TMV)**.
 - » **Hosts:** ToMV hosts include tomato, tobacco, peppers, and certain ornamental plants.
 - » **Spreading mechanism:** It mainly spreads through infected seeds, saplings, agricultural tools and often, through the hands of nursery workers who have failed to sanitize themselves before entering the field. It would require only few infected saplings for virus to take over an entire field in matter of days.
 - » **In the present case**, farmers have blamed seed manufacturers and nurseries.
- **About Cucumber Mosaic Virus (CMV)**
 - » It was first identified in cucumber in 1934, which gave the virus its name.

- » **Hosts:** It has much larger host pool that include cucumber, melon, eggplant, tomato, carrot, lettuce, celery, cucurbits (member of gourd family, including squash, pumpkin, zucchini, some gourds, etc.) and some ornamentals.
- » **Spreading mechanism:** They spread by aphids, which are sap-sucking insects. CMV too can spread through human touch, but the chances of that are extremely low.
- **Impact of these viruses:**
 - Both viruses can cause almost 100% crop loss unless properly treated on time.
 - The foliage of **plants infected by ToMV** shows alternating yellowish and dark green areas, which often appears as blisters on the leaves. Distortion of leaves and twisting of younger leaves are also symptoms. The fruit develops necrotic spots, which leads to overripening. Younger plants are dwarfed, and fruit setting is affected.
 - **CMV** too causes distortion of leaves, but the pattern is different. Often leaves at the top and bottom are distorted while those in the middle remain blemish free. Overall, it causes stunting and lower production.
- **Controlling these viruses:**
 - Following biosafety standards in nurseries, and compulsory seed treatment to stop spread of ToMV.
 - Awareness among farmers: Farmers who buy trays of saplings should check before planting and discard any visible infected material. They should also look for signs of infection during cropping cycle and remove any infected plants without allowing it to touch the healthy ones.
 - Any eye must be kept on aphid migration so that measures can be taken while planting the crop.

3) SPICES

A) SPICE BOARD OF INDIA

- Spices Board (**Ministry of Commerce and Industry, Government of India**) is the flagship organization for the development and worldwide promotion of Indian spices.
 - » The Board is an international link between the Indian exporters and the importers abroad.
 - » The Board has been spearheading activities for excellence of Indian spices, involving every segment of the industry.
 - » The Board has made quality and hygiene the corner stones for its development and promotional strategies.
- It was established in 1987 under Spices Board Act, 1986 with the responsibility of production/development of cardamom and export promotion of 52 spices.
- **Key activities:**
 - » Spice export promotion.
 - » Quality control
 - » Guiding farmers to get better yield.
 - » Provisions for financial and material support to farmers.
- **Headquarter: Kochi**
 - » Regional laboratories in Mumbai, Chennai, Delhi, Tuticorin etc.

B) TURMERIC AND TURMERIC BOARD

- **Turmeric** (*Curcuma longa*) is used as condiment, dye, drug and cosmetic in addition to its use in religious purpose.
- **India** is not only the leading producer and consumer but also the largest exporter of turmeric in the world.
 - » In the year 2022-23, a total of 3.24 lakh hectare was under turmeric cultivation with a production of 11.61 lakh tonnes (over 75% of the global production)
 - » **More than 30 varieties** of the turmeric are grown in India in more than 20 states.
 - » **Telangana (+Andhra Pradesh)** alone has 35.0% of the turmeric area and 47.0% of production.
 - **Telangana** (28.09%)
 - **Andhra Pradesh** (6%)
 - » **Maharashtra** (22.04%) of production comes second. I
 - » **Odisha, Karnataka, WB, Gujarat, Meghalaya, Assam**, etc. are some other major turmeric producing states.
- **Climate and Soil:**
 - » Turmeric can be grown in diverse tropical conditions from sea level to 1500 m above sea level, at a temperature range of 20-35°C with an annual rainfall of 1500 mm or more, under rainfed or irrigated conditions. Though it can be grown on different types of soils, it thrives best in well-drained sandy or clay loam soils with a pH range of 4.5-7.5 with good organic status.

NATIONAL TURMERIC BOARD (NOTIFIED IN OCT 2023)

- **GoI** notifies establishment of National Turmeric Board.
 - » The board will work towards development and growth of turmeric and turmeric products in the country.
 - » It will provide leadership in turmeric related matters, augment the efforts, and facilitate greater coordination with Spice Board, and other government agencies in the development and growth of turmeric sector.
 - » The board will also work towards usefully extracting turmeric's full potential for humanity.
- **Under Ministry of Commerce and Industry**

4) LOTUS – NAMOH 108

- **News:** Science Minister Jitender Singh unveiled a variety of lotus called 'Namoh 108' at a function in the CSIR-National Botanical Research Institute, Lucknow. He described it as a "grand gift to the relentless zeal and innate beauty of Shri Narendra Modi, coming as it does in the 10th year of his tenure as the Prime Minister."
- **About the lotus:**
 - » It has 108 petals and was discovered several years ago in Manipur. It was kept at the National Botanical Research Institute (NBRI) as part of its collection of flowers and plants, on which the institute conducts research. However, it wasn't until four years ago that one of the scientists discovered that it had 108 petals. This number has religious significance in Hinduism.

- » Other features of the flower on initial inspection was ordinary. It's fibre quality was less and it bloomed only in one season.
- » Recently, it has become the first (and only) lotus variety whose gene has been sequenced. The only other lotus variety to be sequenced in the world was from China and it was completely different.
- **Scientists have also worked on its germplasm** and modified its characteristics in a way that it could be cultivated relatively easily outside the Manipur.
- **Note:** At the launch of Namoh 108, minister also launched several fibres and perfumes made from NAMOH 108.
- **CSIR: NBRI** would be soon initiating a '**Lotus Mission**' as part of larger ongoing horticulture mission to have more of the 108 Namoh flowers grown in other part of India.

5. FARMER PRODUCER ORGANIZATION (FPOs)

- **Introduction:**
 - » FPOs are collectivization of primary producers (farmers, dairy farmers, fishermen, weavers etc.), especially small and marginal farmers, to collectively address their key challenges and ensure economies of scale viz improved access to investment, technology, input and markets.
 - » While FPOs work under the principle of cooperative societies, their **registrations under Company's Act** provides more accountability and professionalism.
 - » Small Farmers Agri-business consortium (SFAC) has been mandated by Ministry of Agriculture, to support state governments in the formation of FPOs.
- **Aims behind FPOs/ Advantages of FPOs**
 - » **Enhance bargaining power** of farmers.
 - » **Increase farmers competitiveness** and their profits in emerging market economies.
 - » FPOs enable farmers to **enhance productivity** through efficient cost-effective and sustainable resource use and realize higher returns of their produce.
 - » FPO's also enable integration of small farmers to the value chain, generating higher incomes and employments.
- **Steps taken to promote FPOs/FPCs**
 - » **Central Sector Scheme** titled '**Formation and Promotion of 10,000 FPOs**'
 - Launched in Feb 2020 at Chitrakoot (Uttar Pradesh) with a budgetary provision of Rs 6865 crores.
 - Under the scheme, formation of 10,000 FPOs across the country is targeted in five years till 2023-24, while providing adequate handholding to each FPO for five years from the formation, for which the support will continue till 2027-28.
 - » **Budget 2018-19: Exemption from Income Tax** for FPOs with a turnover of upto Rs 100 crore.

6. SPECIAL AGRICULTURE PRACTICES AND ADVANTAGES

1) CROP DIVERSIFICATION

- **Introduction**
 - Crops diversification refers to shift in cropping pattern from one or a few crops to other crops which are more profitable, sustainable or less resource intensive.
- **Advantages:**
 - **Risk Mitigation:** Farmers growing multiple crops are less vulnerable to adverse weather conditions, pests, diseases, or market fluctuations affecting a particular crop.
 - **Sustainability:**
 - **Improved Soil Health**
 - Reduce use of water and chemical fertilizers.
 - **Planting diverse crops disrupts pest, weed and disease cycle.**
 - For e.g. Certain crops have allelopathic properties or growth habits that suppress weeds. By including such crops in a diversified cropping system, weed growth can be effectively controlled without heavy reliance on herbicide.
 - Improves the availability of fodder for livestock animals.
 - **Fighting the challenges of Monoculture:**
 - **Supports biodiversity:** By providing habitats for beneficial insects, birds, and pollinators.
 - **Resilience to climate change** as different crops will have varying level of tolerance to changing climatic conditions.
 - **Food Security and Nutrition** - Crop diversification will promote healthier diets and reduce risk of nutritional deficiency.
 - **Increased income for farmers** - By diversifying to high value horticulture crops.
- **Steps taken to promote diversification.**
 - **Crops Diversification Program** (a sub scheme under RKVY) is being implemented by government 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, and shifting of tobacco farmers to alternative cropping system in tobacco growing states viz. Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Odisha, TN, Telangana, Uttar Pradesh and West Bengal wef from 2015-16.
 - Under CDP, assistance is provided to states for conducting cluster demonstration on alternate crops, promotion of water saving technologies, distribution of farm machineries, setting up of value addition facilities, awareness through training etc.
 - **Crop Diversification through Price Policy** -> Increasing MSP for crops which need to be promoted.
- **Status in India**
 - India has tremendous potential for crop diversification and to make farming a sustainable and profitable economic activity.
 - **The Index of Crop Diversification** (used by ESI 2017-18) analysis shows:
 - i. **Declining inter-temporal behaviour** in crop diversification for the states like Chhattisgarh, Haryana, MP, Odisha, Punjab and Uttar Pradesh. The decline has been sharp in Odisha (from 0.74 in 1994-1995 to 0.34 in 2014-15).
 - ii. **Two states - Himachal and Jharkhand** have seen increasing crop diversification.
 - iii. **For India as a whole** the crop diversification scenario appears to be stable throughout the period.
- **Factors behind decreasing crop diversification in some states**
 - **Minimum Support Price**
 - **Lack of awareness among farmers.**
 - **Limited Input Availability:**
 - **Risk Perception and Market Volatility**

2) INTEGRATED FARMING SYSTEM

- **Introduction**
 - » Integrated Farming System (IFS) is a comprehensive farming approach that combines multiple agricultural activities and components within farming system to optimize resource utilization, increase productivity, and improve sustainability. It involves the integration of crops, livestock, fisheries, agroforestry, and other allied enterprises (renewable energy - biogas generation) in a synergistic manner.
- **IFS** is helpful in sustaining agricultural production in the following ways:
 - i. **Resource Optimization and Enhanced Productivity:** Integration of various components like crops and livestock can make efficient use of resources and minimize waste.
 - **For example**, crop residues and agricultural by-products can be utilized as livestock feed, while animal waste can be recycled as organic fertilizer for crops.
 - ii. **Nutrient Cycling and Soil health:**
 - Livestock manure and crop residues serve as organic fertilizers, improving soil fertility and nutrient availability.
 - The integration of leguminous crops in crop rotations adds nitrogen to the soil through biological nitrogen fixation.
 - Soil Conservation Practices like contour ploughing and agroforestry, help prevent erosion and maintain soil health.
 - iii. **Pest and Disease management:**
 - i. Diversity of crops and livestock reduces the risk of pest and disease outbreaks.
 - ii. Crop rotation, inter-cropping, and mixed cropping help disrupt pest life cycles and reduce pest pressure.
 - iv. **Climate Resilience:**
 - The integration of trees and agro-forestry practices help mitigate climate risks by providing shade, reducing wind speed, improving water filtration, and sequestering carbon.
 - Diverse Crop pattern is also more adaptable to climate variability.
 - v. **Economic security through income diversification:** IFS offers multiple income stream (crops, livestock, etc.) which reduces income risk associated with single crop.
 - vi. **Environmental Sustainability:**
 - **Reduced Pollution and land degradation:** IFS reduces the need for synthetic fertilizers, mitigates nutrient runoff and pollution, and enhances soil health and long-term sustainability.
 - **Biodiversity Protection:** The integration of diverse components helps conserve biodiversity, protect natural habitats, and provide ecological niche for beneficial organisms.

3) PRECISION AGRICULTURE

- **About Precision Agriculture**
 - » Precision Agriculture is a technique of agriculture which uses technology to determine the exact amount of input (water, fertilizers, pesticides etc.) required to ensure crops and soil receive exactly what they need for optimum health and productivity.

- » This kind of agriculture is highly dependent on technology - Specialized equipment, software and IT.
 - It requires accessing real time data about the conditions of crops, soil and ambient air. It also needs hyper local weather predictions, labor costs, and equipment availability.
 - **Sensors** in the field measure the moisture content and temperature of the soil and surrounding air.
 - **Satellites and Robotic drones** provide real time images of individual farmers.

- **Advantages**

- » **Economic Benefits**
 - Increase agri-productivity.
 - Improve the quality and reduce the cost of production
 - Improved socio-economic condition of farmers
- » **Improve Sustainability of Agriculture**
 - Prevent Soil Degradation
 - Reduce Chemical application.
 - Efficient resource use (water, fertilizers etc.)
 - E.g. Drip Irrigation used with PA technology can reduce the amount of water used in crops.
- » **PA enables Climate-Smart Agriculture**

4) MULTILAYERED FARMING

- It comprises of growing compatible plants of different heights on the same field at the same time. It is mostly practiced in orchards and plantation crops for maximum use of solar energy even under high planting density.
- **Advantages**
 - » **Efficient Land Use**
 - » **Diversification and Risk Reduction**
 - By growing variety of crops, farmers can diversify their produce, accessing different markets, and reducing price risks.
 - **Better Income:** The sale of high value crops, such as fruits, vegetables, herbs, and spices can generate higher returns compared to traditional mono-cropping.
 - » **Resource Efficiency:**
 - For e.g. different layers of crops create micro-climates that reduce water evaporation and help retain soil moisture.
 - The **crops complement each other** - for e.g. by providing shade canopy, litter, increasing moisture holding capacity of soil while nurturing microflora.
 - » **Nutrient Cycling and Soil Health:** it promotes the recycling of nutrients within the system, enhancing soil fertility and reducing the need of synthetic fertilizers
 - » **Biodiversity Conservation:** MLF creates diverse and complex habitats, supporting a range of beneficial organisms, including pollinators, beneficial insects and natural predators. Multiple crops and flowering plants provide food and shelter for a variety of beneficial organisms.
 - » **Income generation and livelihood improvement:**

- E.g.
 - **Coconut based multilayered farming** (Coconut, pepper, nutmeg, banana, cinnamon, turmeric, ginger) is more remunerative than traditional systems.
- **Steps being taken in India to promote Multi-Layered Farming**
 - » The Indian Institute of Farming Systems Research, Modipuram, Meerut, is **undertaking research (on-station) and technology validation** through farmer's participatory research (on-farm research) on Integrated Farming Systems and Cropping systems in 24 states.
 - » **Multi-layer Farming Models on high-value vegetable cultivation** under a three-tier system was introduced in the backward districts of Bihar by ICAR and farmers were able to grow three different vegetables on the same piece of land at a time.

7. NEXT CA BOOKLET

- Storage Issues
- MSP and Subsidy Issues
- Income Support: PM-KISAN
- Food Security
- FCI and its function
- PDS System
- Agri-market Reforms
- E-Technology
- Agri-Exports
- Animal Husbandry, Fishery etc.