SIVARAJAVEL IAS ACADEMY
AN IDEAL INSTITUTE FOR CIVIL SERVICE EXAMS

TOPICS & POINTERS

Exclusively For
UPSC Mains 2023

AGRICULTURE

GENERAL STUDIES-1

MAINS WORK BOOK

METIS 2023

Mentoring and Enabling Through Intelligent Support System

TOPICS AND POINTERS

2023- MAINS STUDY MODULE

AGRICULTURE

THEMES

1. Factors determining cropping pattern in India
2. Rice – Wheat cropping system
3. Crop diversification
4. Emerging trends/technologies for cropping pattern in India
5. Millets production in India
6. Pulses production in India
7. Oilseeds production in India
8. Micro irrigation

Conservation Agriculture

9. Organic farming
10. Climate Smart Agriculture
11. Zero Budget Natural farming
12. Zero tillage
13. Permaculture
14. Vertical farming
15. Precision farming
16. System of Rice intensification

Agri. and food management

17. Process of Agricultural marketing
18. Problems of current agricultural marketing
19. Agricultural Produce Market Committee (APMC)
20. e-NAM - Salient features and Benefits
21. Farmer Producer Organization (FPO)
22. Small Farmers Agribusiness Consortium (SFAC)
23. Contract farming
24. Crop Insurance in India
25. Agriculture subsidies
26. Minimum Support Price (MSP)
27. WTO and subsidies
28. Revolutions for food security and poverty alleviation
29. Public Distribution System (PDS)
30. Modernization of Targeted Public Distribution System (TPDS)
31. National Food security Act -2013
32. Economics of animal rearing
33. Integrated Farming System (IFS)
34. Food processing in India

Previous Year Questions

Major Crops - Cropping Patterns in various parts of the country

1. What are the major reasons for declining rice and wheat yield in the cropping system? How crop diversification is helpful to stabilize the yield of the crop in the system?
2. How has the emphasis on certain crops brought about changes in cropping patterns in recent past? Elaborate the emphasis on millets production and consumption.
3. Sikkim is the first 'Organic State' in India. What are the ecological and non-economic benefits of Organic State?
4. What are the major factors responsible for making rice-wheat system a success? In spite of the success how has this system become bane in India?

Different Types of Irrigation and Irrigation Systems

5. What is water-use efficiency? Describe the role of micro-irrigation in increasing the water-use efficiency
6. Elaborate the impact of National Watershed Project in increasing agricultural production from water-stressed areas.
7. Suggest measures to improve water storage and irrigation system to make its judicious use under depleting scenario.
8. How and to what extent would micro-irrigation help in solving India's water crisis?

Storage, Transport and Marketing of Agricultural Produce and Issues and Related Constraints

9. **What are the main bottlenecks in upstream and downstream process of marketing of agricultural products in India?**
10. There is also a point of view that agriculture produce market committees (APMCs) set up under the state acts have not only impeded the development of agriculture but also have been the cause of food inflation in India. Critically examine.
11. In view of the declining average size of land holdings in India which has made agriculture non-viable for a majority of farmers, should contract farming and land leasing be promoted in agriculture? Critically evaluate the pros and cons.
12. What are the main constraints in transport and marketing of agricultural produce in India?
13. Given the vulnerability of Indian agriculture to vagaries of nature, discuss the need for crop insurance and bring out the salient features of the Pradhan Mantri Fasal Bima Yojana (PMFBY)
14. Assess the role of National Horticulture Mission (NHM) in boosting the production, productivity and income of horticulture farms. How far has it succeeded in increasing the income of farmers?

E-technology in the aid of farmers; Technology Missions

15. What is allelopathy? Discuss its role in major cropping systems of irrigated agriculture.
16. What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification?
17. How can the 'Digital India' programme help farmers to improve farm productivity and income? What steps has the Government taken in this regard?

Issues related to Direct and Indirect Farm Subsidies and Minimum Support Prices

18. What are the different types of agriculture subsidies given to farmers at the national and state levels? Critically analyze the agriculture subsidy regime with the reference to the distortions created by it.
19. "In the villages itself no form of credit organisation will be suitable except the cooperative society." – All Indian rural credit survey. Discuss this statement in the background of agriculture finance in India. What constrain and challenges do financial institutions supplying agricultural finances? How can technology be used to better reach and serve rural clients?
20. How do subsidies affect the cropping pattern, crop diversity and economy of farmers? What is the significance of crop insurance, minimum support price and food processing for small and marginal farmers?
21. What do you mean by Minimum Support Price (MSP)? How will MSP rescue the farmers from the low-income trap?

Public Distribution System - Objectives, Functioning, Limitations, Revamping; Issues of Buffer Stocks and Food Security

22. **What are the major challenges of Public Distribution System (PDS) in India? How can it be made effective and transparent?**
23. Food security bill is expected to eliminate hunger and malnutrition in India. Critically discuss various apprehensions in its effective implementation along with the concerns it has generated in WTO
24. Explain various types of revolutions, took place in Agriculture after Independence in India. How these revolutions have helped in poverty alleviation and food security in India?
25. What are the reformative steps taken by the government to make food grain distribution system more effective?
26. What are the salient features of the National Food Security Act, 2013? How has the Food Security Bill helped in eliminating hunger and malnutrition in India?

Economics of Animal-Rearing

27. **What is Integrated Farming System? How is it helpful to small and marginal farmers in India?**
28. India needs to strengthen measures to promote the pink revolution in food industry for better nutrition and health. Critically elucidate the statement.
29. Livestock rearing has a big potential for providing non-farm employment and income in rural areas. Discuss suggesting suitable measures to promote this sector in India.
30. How far is Integrated Farming System (IFS) helpful in sustaining agricultural production?

Food Processing and Related Industries in India- Scope' and Significance, Location, Upstream and Downstream Requirements, Supply Chain Management

31. **Elaborate the scope and significance of the food processing industry in India.**
32. What are the impediments in marketing and supply chain management in industry in India? Can e-commerce help in overcoming these bottlenecks?
33. What are the reasons for poor acceptance of cost-effective small processing unit? How the food processing unit will be helpful to uplift the socioeconomic status of poor farmers?
34. Examine the role of supermarkets in supply chain management of fruits, vegetables and food items. How do they eliminate number of intermediaries?
35. What are the challenges and opportunities of food processing sector in the country? How can income of the farmers be substantially increased by encouraging food processing?

1.	**Factors determining cropping pattern in India**	

Physical factors:

- **Climate**: Dry regions where rainfall is low, millets like jowar and bajra; sugarcane is preferred in southern India due to warmer temperatures.
- **Soil** (topography, fertility, drainage): Tea and coffee mono-cropped in regions with high rainfall and well drained slopes; cotton grown in black soil; etc.
- **Seed quality**: Availability of good quality and HYV seeds shifting trends
- **Diseases**: Forces farmers to avoid disease prone crops

Economic factors:

- **Price**: Exerts an influence on acreage shifts. Cash crops.
- **Changing consumption pattern**: Rising nutritional awareness and increasing preference for healthier food like fruits, protein and millets.
- **Farm size**: Small farmers go for subsistence farming while large farm owners go for profitable crops.
- **Availability of inputs** like fertilizer, farm machinery and credit.
- **Management techniques**: Crop rotation and mixed cropping practices like intercropping, integrated farming etc.
- **Labour availability**: Factors like migration, schemes like MNREGA affect the availability of labour.
- **Tenure**: In crop sharing system, the landlord's choice is dominant and it is often towards earning maximum profit.
- **Involvement of private sector**: Rise of contract farming; crops in demand are chosen.

Infrastructure facilities:

- **Irrigation**: When water is available throughout the year, double or even triple cropping is possible. Ex: Punjab and well-irrigated deltaic regions; Sardar Sarovar project can change the cropping pattern of the region which used to follow mono-cropping which is not a healthy practice.
- **Transport**: Better connectivity means better choices and better availability of backward and forward linkages.
- **Storage**: Better storage facilities including cold chain storage. Encourages farmers to go for perishable crops.
- **Market**: Accessibility to markets so that the seller can find the best buyer and avoid distress sale. Ex: Density of APMC mandis

	– **Processing**: Presence of mills and other processing units. Ex: Sugarcane increasing in southern India. **Policy factors:** – **Legislative and administrative policies**: National Food Security Act, Food Crops Act, Land Use Act, Essential Commodities Act etc – **Loan waiver**: Populist measures focusing on farmers who comprise of a huge vote bank. – **MSP**: Only specific crops are covered. – **Green Revolution**: Specifically pushed farmers towards wheat and rice. Also skewed pattern across the nation since only a few regions were targeted. – **MNREGA**: 100 days of wages means lesser incentive to till during lean seasons. **Social factors:** **Food habits**: For ex, North Indians prefer wheat while Eastern and South Indians prefer rice. Differences in cooking oil too.	
2.	**Rice – Wheat cropping system**	
	Regions & factors – **MSP**: Assured income has prompted farmers to develop the system and not worry about low prices. – **Input subsidies** like on land, water and freebies like electricity. – **Green Revolution**: Availability of HYV seeds offering higher yield than any other crop. – **Fertilizer and irrigation availability**: Led to increase in area of cultivation. Output per acre also grew. – **Regions chosen and their social background**: Regions like Punjab, Haryana and parts of Western UP and TN. Wheat being the staple food crop of northern India while it is rice for southern India – core food preferences. – **High cropping intensity** offers higher productivity and in turn better income. – **Green fodder** is produced which can support large livestock populations. **Current issues & challenges**: – **Mono-cropping**: Risk of crop failure due to climate or disease; hinders the idea of crop diversification. – **Decrease in cash crops**: Some farmers are unable to go for crops beyond their own subsistence needs - plateauing of income & productivity. – **Fiscal challenge**: shift of consumer in the recent times but rice and wheat production has more than doubled since 2006 – supply demand mismatch.	

	– **Yield is dependent on climatic factors** – not climate resilient. – **Environmental problems**: Rice fields - methane generation (global warming); rice stubble burning; loss of biodiversity due to HYV seeds; ground water exploitation. – **Hidden hunger**: Rice and wheat aren't enough to provide a holistic nutrition and lack in several micro-nutrients unlike millets. **Opportunities for increasing productivity** – Cornerstone of securing India's food security. – **Social reasons**: Two crops still remaining as staple food of most Indians. – **Global factors** like Ukraine crisis has led to wheat shortage – starving economies are looking for alternative options other than Ukraine and Russia. – **Food processing**: Newer opportunities including higher export possibilities. **Way forward:** – Alternative to wheat-rice system. – Stronger backward and forward linkages for other crops. Inclusive Ever Green Revolution as a core pillar of sustainable development.	
3.	**Crop diversification**	
	Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing opportunities. **Types & features:** – **Crop rotation**: Will increase production; including legumes will help in nitrogen fixation; suppresses disease spread. – **Mixed farming**: Insurance against failure of one crop; suppresses diseases; climate change buffer. – **Genetic diversification in monoculture**: Increased production, stability and better. – **Agro-forestry**: Trees along with crops – added income – **Integrated farming** (including livestock): Ex- rice-fish cropping – added income, more natural. – **Micro-watershed-based diversification**: Integration of crops with other farming components for year-round income and employment.	

	Need for diversification: – Risk of crop failure – due to disease as well as climate – Livestock population in India: Need to be included. – Ever growing need for sustainable development. – Climate change and biodiversity loss related risks need to be mitigated. – Need to sustain a huge and growing population. **Benefits of diversification:** – Increases farmer's income. – Increases natural biodiversity and productivity. – Reduces risk of total crop failure – Food security – Improves economy by accessing different markets – Helps in price risk management – Conservation of certain crop species as well as techniques such as introducing legumes in crop rotation. **Challenges:** – Most parts of the country are still rain-fed. – Inadequate supply of seeds for most crops and lack of subsidies like MSP. – Fragmentation of land forcing monoculture – Poor investment in agri sector – Lack of awareness, knowledge and training. **Govt policies:** – Technology Mission for Integrated Development of Horticulture in NorthEast Region: Providing missing links – National Agriculture Insurance Scheme: to cover food crops, oilseeds and horticulture – Sub-Mission on Agro-forestry scheme – Mega Food Parks: Incentivises crop diversification. Pradhan Mantri Fasal Bima Yojna	
4.	**Emerging trends/technologies for cropping pattern in India**	
	Intro: – We need new and resilient techniques like Aquaponics and urban farming **Recent Use of Tech:** – **Zero till cultivation of wheat** is being demonstrated in upper and mid gangetic regions by IARI, New Delhi→Significant savings on tillage, higher benefit cost ratio – Heat tolerant rice genotypes for north eastern region	

- "**Design of Micro Irrigation Systems (DOMIS)**" is presented to help the user to design appropriate micro irrigation systems for efficient water utilization under different agro-climatic conditions for any crop under different sources of water availability
- **Broad bed former-cum-seeder** (has the potential to increase the productivity of wheat and soybean crop even in adverse climatic conditions)
- **Tractor drawn pneumatic precision planter** (suitable for precise planting of single seed at predetermined seed/row spacing
- **Tractor drawn vegetable transplanter** (suitable for transplanting of tomato, chilli, cabbage, cauliflower and brinjal crops)
- **Millet m**ill (for dehulling small millets like foxtail millet, little millet, kodo millet, proso millet and barnyard millets)
- **Micropropagation Technology** etc

Role of Emerging New Technology and Agri:

Indoor Vertical Farming

- sustainable urban growth, 70% less water, controlled variables, Less labor

Automation And Robotics

- Smart farming: drones, autonomous tractors, robotic harvesters, automatic watering, and seeding robots.

Livestock Technology

- Nutritional technologies, genetics, digital technology- concept of the 'connected cow' eg: . Pashu Aadhaar→ Sensors to identify sick animals

Modern Greenhouse Practices

- Shifting form Research to Large scale commercial facilities-Modern greenhouses are becoming increasingly tech-heavy, using LED lights and automated control systems

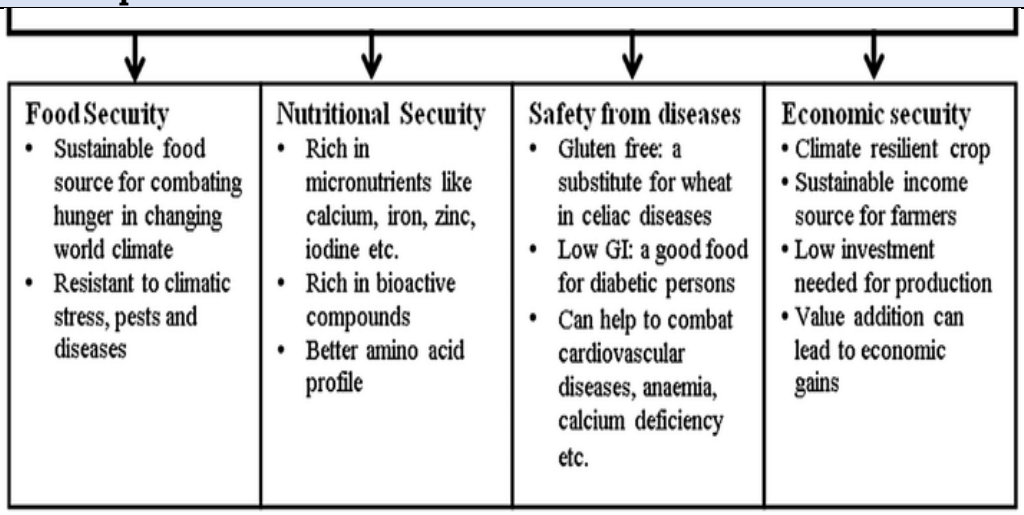
Precision Agriculture and Artificial Intelligence

- GPS, drones, and satellite images. Based on this data, farmers receive information on all key issues: crop status, weather forecasts, environmental changes, etc—Zone based Agri

Blockchain.

- Blockchain's capability of tracking ownership records and tamper-resistance can be used to solve urgent issues such as food fraud, safety recalls, supply chain inefficiency and food traceability in the current food system

5. Millets production



Major Initiatives by the Government to Promote Millets

- In view of the nutritional value of the millets, the Government has notified millets as **nutri-cereals** in April, 2018.
- Under the Sub Mission on **National Food Security Mission (NFSM)-Nutri Cereals** is creating awareness among farmers for Nutri Cereals (Millets) such as ragi, sorghum, bajra and small millets.
- Under NFSM–Nutri Cereals, **incentives** are provided to the farmers, through the state governments. **Capacity building** of farmers is also done through trainings.
- Eight **bio-fortified varieties/hybrids** of Bajra have been released for cultivation from 2018 to till date
- For increasing exports through quality production and processing, Agricultural and Processed Food Products Export Development Authority (**APEDA**) signed a Memorandum of Understanding (MoU) with ICAR-Indian Institute of Millet Research (**ICAR-IIMR**) which is expected to boost value addition and farmers' income.
- **NITI Aayog** signed a **Statement of Intent (SoI) with United Nations World Food Program (WFP**) on 20 December 2021. The partnership focuses on mainstreaming of millets and supporting India in taking lead globally in knowledge exchange.

6. Pulses production in India

- India's pulses production -> increased significantly in the last few years & dependences on pulses import reduced.
- **MSP of pulses** -> increased from 40% to 73% in 6 years.
- Output has increased to 240 lakh tonnes (from 140 lakh tonnes) in 6 years -> because of the efforts made by farmers,

scientists & government's initiative.

- India currently produces **25 percent** of the world's pulses output.
- Per capita availability of pulses -> reached 55.9 gram/day, as against ICMR recommendation of 52 gram/day pulse requirement.

Advantages of pulse production:

- Pulses/legumes are rich in **nutritional/protein values** -> important part of a healthy diet -> contribute to achieving 2030 Agenda of Sustainable Development.
- Plays a critical role in marking challenges of poverty, food chain security, degraded health & climate change.
- It is highly water efficient & **climate resilient** crop.
- It helps in soil fertility by **fixing nitrogen** & promoting soil microbes.

Constrains:

- Pulses production in India -> marred by absence of high-yielding varieties & pests/diseases resistant, low level of mechanization, lack of assured market, ineffective government procurement, unfavourable prices & trade liberalization -> make pulse production less attractive for farmers.
- Lack of serious attempt to use advanced technology in harvesters & threshing machines.
- Pulses in India -> mostly grown in **rain-fed areas** -> increases the risk of crop failure.
- Poor access to storage & milling facilities causes further risk to farmers.
- Poor market linkages -> cause constraints in meeting market demand.

Government efforts to increase production of Pulses

- **150 Seed Hubs** created at ICAR institutes, State Agriculture Universities (SAUs) and Krishi Vigyan Kendras (KVKs) for increasing certified seeds production of pulses.
- Distribution of **seed mini-kits of pulses free of cost** to the farmers of the varieties notified within 10 years.
- Assistance is provided to Central Seed Agencies to produce certified seed of latest varieties of pulses.
- A new scheme "**Intercropping of pulses with sugarcane**" was implemented in 12 States namely- Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Telangana, Uttar Pradesh and Uttarakhand during 2018-19 and 2019-20.
- Launched **Targeting Rice fallow Area (TRFA)** programme under NFSM in 11 states.

	- To improve availability and stabilise prices of pulses, the Government has allowed the import of Tur, Urad and Moong under **'Free category'** w.e.f May 15, 2021 till October 31, 2021 in order to ensure smooth and seamless imports - Under **Price Stabilization Fund (PSF**) the Government has increased the buffer target for pulses from 19.5 LMT in financial year 2020-21 to 23 LMT in the financial year 2021-22.	
7.	**Oil seeds**	
	India holds a significant share in world oil seed production. Oilseeds cultivation is undertaken across the country in about 27 million hectares mainly on marginal lands, of which **72% is confined to rainfed farming**. **About Oilseeds** – Oilseed crops are the second most important determinant of the agricultural economy, next only to cereals within the segment of field crops. – Despite being the **fifth largest oilseed crop producing** country in the world, India is also one of the largest importers of vegetable oils today. – India **buys more than two-thirds** of its total edible oil imports as palm oil. – After China, India is the second largest producer of groundnut and is third in position in the production of Rapeseed after China and Canada. – Four main concerns for oil seed and oil producers in India are: • Lack of Micro-irrigation Infrastructure • Non availability of quality seeds • Lack of marketing infrastructure and • Government policies **Steps to increase Edible Oil Production in India:** – The government has also launched the **Kharif Strategy 2021 for oilseeds.** – It will bring an additional 6.37 lakh hectare area under oilseeds and is likely to produce 120.26 lakh quintals of oilseeds and edible oil amounting to 24.36 lakh quintals. **National Edible Oil Mission-Oil Palm (NMEO-OP):** - Government has announced the National Edible Oil Mission-Oil Palm (NMEO-OP) scheme for self-reliance in edible oil and involves investment of over Rs. 11,000 crore (over a five year period).	

Way Forward:

- The government should approve **Genetically Modified cultivation for oil seeds** to increase production.
- there must be a **micro-level plan with technological support.**

The measures to increase our oilseed production and reduce import bills are:

- **Farm-level measures**
  1. **Targeted focus** based on the agro-climatic conditions and incentivisation of farmers to cultivate the suitable crop of region.
  2. Large scale adoption of **agro-ecological methods like System of Crop Intensification, Relay Cropping is needed**.
- **Policy-level measures**
  1. **Policies and missions like NMOOP, ISOPOM** to incentivise the very cultivation of oilseeds on a per hectare basis.
  2. Provide incentives to private sector participation in processing and value addition in oilseed crops.

Conclusion:

- With growing population and increasing disposable income, the demand for oil will increase. Public funds should be spent on lasting solutions for India's edible oil crisis.

8. Micro Irrigation

Micro-irrigation system is a modern method of irrigation. Micro-irrigation system has become popular these days for its low cost and water-efficiency.

Types

There are majorly 5 types of micro irrigation system. They are Drip irrigation, Sprinkler irrigation Spray irrigation, Subsurface irrigation, and Bubbler irrigation.

Significance

- Micro-irrigation ensures **water use efficiency** as much as 50-90%.
- Water savings in comparison with flood irrigation are to the tune of 30-50%, with an average of 32.3%.
- **Electricity consumption** falls significantly.
- Adoption of micro-irrigation results in **savings on fertilizers**.
- Increase in the average productivity of fruits and vegetables.
- It leads to overall enhancement of farmers' income.

Present status

- The average penetration of micro irrigation in India is **19%** (as

	on February 2021), which is much lesser than many countries. – 27 states in India have less than 30% micro irrigation system out of which 23 have less than 15%. **Governments initiatives for micro irrigation** – **National Mission on Micro Irrigation (NMMI)** and **National Mission for sustainable Agriculture (NMSA)** were launched with a clear mission to promote Micro irrigation systems. – **Pradhan Mantri Kisan Sinchai Yojana** to solve this problem. water conservation and increasing water use efficiency. Under this scheme small farmers will be paid 55% subsidy to install micro irrigation systems. **Disadvantages/Challenges** – High initial investment – It's usually affected by climatic conditions, water sources, and expense. – When operating at high temperatures, water can evaporate at a fast rate degrading the effectiveness of the irrigation. – It depends on a clean source of water and therefore may not be suited to areas where rainfall and groundwater sources are limited. Non availability of uninterrupted electric power.	
9.	**Organic farming**	
	– Food safety => major concern & necessity. – Extensive usage of chemical fertilizers & pesticides -> impediment to maintain a proper health. – Organic farming -> opens up a sustainable doorway to prevent various health hazards originating from agro-based products. – According to FSSAI => 'Organic farming' is a system of farm design & management to create an ecosystem of agriculture production without the use of synthetic external inputs such as chemical fertilisers, pesticides & synthetic hormones or genetically modified organisms. **Organic Farming in India** – India ranked 1st -> in number of organic farmers; 5th -> in terms of certified organic area; 8th in the world's total organic agricultural land. – 51% increase in the production of organic products in 2020-21. – **Sikkim** -> only state -> fully organic (so far) – North East India, tribal & island territories -> traditionally organic. **Important Government Initiatives** – **Paramparagat Krishi Vikas Yojana** -> promotes cluster based organic farming.	

- **Rashtriya Krishi Vikas Yojana** -> assistance for promotion of organic farming.
- Food Safety and Standards Authority of India (**FSSAI**) -> responsible for regulating organic food in domestic market & imports.

Benefits of organic farming:

- Better Taste & More Nutrition => given much longer time to develop & not pumped with artificial things.
- Reduces pesticide & chemical residue in soil -> ensures health of soil, water, air, flora & fauna.
- Crop rotation to build soil fertility & raising animals -> naturally promotes biodiversity.
- Consumes less energy -> because manufacturing of synthetic fertilizers consumes significant energy.
- Takes proactive/preventative approach -> helps for long-term sustainability.
- Reduced erosion & better water management
- Familiarity with the techniques => farmers can easily understand & adapt to the techniques of organic farming that deploys traditional knowledge.

Challenges in Organic Farming

- Not sure whether all the nutrients with required quantities can be made available by organic materials -> Shortage of Biomass.
- Disparity of Supply and Demand -> non-perishable grains can be grown anywhere and transported to any location -> but this is not the case with fruits/vegetables.
- Requires more time because of greater interaction between a farmer & crop for observation, timely intervention & weed control.
- High MRP.
- Marketing of organic produce -> not properly streamlined.

Way Forward

- Upgrading of technology & empowering research in agriculture -> impetus to organic farming.
- Assure income generation & reduced dependence on external products.
- Integrating the natural way in farming system by active collaboration with international community & government interventions.
- Greater awareness & capacity building of producers in international standards -> to capture domestic market.

  Agricultural universities need to focus more on organic & natural farming -> promote innovation & agri-entrepreneurship.

10.	**Climate Smart Agriculture**	

Introduction

- Climate-Smart Agriculture (CSA) is an approach to help the people who manage agricultural systems respond effectively to climate change.
- CSA => developing agricultural strategies to secure sustainable food security under climate change -> adaptation is the key.

3 objectives:

- Sustainably through increasing productivity & incomes
- Adapting to climate change
- Reducing greenhouse gas emissions

Need for CSA

- Higher temperatures, changes in precipitation patterns, rising sea levels & more frequent/extreme weather events -> risk for agriculture, food & water supplies.
- SDGs (1 & 2) -> envision a world with zero hunger.
- Food supply needs to grow by 60% from 2006 levels by 2030 -> to satisfy the demand for food -> require higher yields but with limited acreage.
- Helps farmers to adapt & mitigate climate change.

Benefits

- CSA provides the means to help stakeholders from local to national/international levels -> identify agricultural strategies suitable to their local conditions.
- In line with FAO's vision for Sustainable Food and Agriculture & supports FAO's goal to make agriculture, forestry and fisheries -> more productive & sustainable.
- Promotes innovative/adaptive farming communities -> working towards restoring & conserving soil health.
- It includes practices like farm ponds, bunding, trenching, mulching etc. -> for conservation of soil moisture.
- Will use land & water optimally, judicial seed selection & adapt to uncertain weather conditions.

Disadvantages:

- Smart agriculture needs continuous/faster availability of internet.
- Smart farming based equipment require farmers to understand & learn the use of technology -> major challenge in adopting at large scale.

Way Forward

- Support farmers (technically & financially).
- Multilateral lending institutions (Ex: World Bank, ADB) -> important role in directing funding.
- Private sector too must be made a partner in implementation

	schemes. – Global partnerships and knowledge sharing are critical pillars of the mitigation strategy. Global Alliance for Climate Smart Agriculture (GA-CSA) will be a key player in propagating policies & action plans for CSA adaptation.	
11.	**Zero Budget Natural farming**	
	– ZBNF => chemical-free agriculture -> from traditional Indian practices (primarily relies on Agro-ecology). – **Alternative to Green Revolution** methods driven by chemical fertilizers, pesticides & intensive irrigation. – Almost 70% of agricultural households -> spend more than they earn; more than 50% of all farmers are in debt - National Sample Survey Office (NSSO) data. – External input costs -> leading cause of indebtedness & suicide among farmers => suggested "zero budget" exercise -> to break the debt cycle. ZBNF is based on 4 pillars: – **Jiwamrita** -> fermented mixture of cow dung & urine. – **Bijamrita** -> seed treatment technique from locally available ingredients including desi cow dung & urine. – **Mulching** -> spreading a layer of material around plants to protect their roots from heat/cold/drought or to keep the fruit clean. – **Waaphasa** -> building up of soil humus to increase soil aeration. **Advantages of ZBNF** – Promotes soil aeration, minimal watering, intercropping -> discourages intensive irrigation & deep ploughing. – Social & environmental programme => ensure small farming economically viable -> by enhancing farm biodiversity & ecosystem services. – Cost of farming is reduced, income increases & restores ecosystem health through diverse/multi-layered cropping systems. – Cow dung has beneficial micro-organisms which decompose dried biomass & convert into nutrients -> revives fertility & nutrient value of soil. – ZBNF requires only 10% water & 10% electricity than chemical/organic farming. – Reduce leaching of nitrogen & phosphorous from soil to groundwater. –	

	Issues Related to ZBNF – Many farmers reverted to conventional farming after ZBNF's return drop after few years (Example: Sikkim) -> raises doubts about its efficacy in increasing farmers' incomes. – India needed Green Revolution to become self-sufficient & ensure food security -> wholesale move away without sufficient proof about yields would be a disaster => National Academy of Agricultural Sciences -> warned against promoting ZBNF. – Cost of labour for collection of dung/urine & other inputs. – ZBNF demands an Indian breed cow, whose numbers are declining at a faster pace. => country's total population of indigenous & non-descript cattle has dropped by 8.1% - Livestock Census. – If ZBNF practiced in isolation, crop grown would be vulnerable to insect/pest attacks. – Government spends more for the Green Revolution schemes than the organic farming schemes. – Recently, Sri Lanka government banned agrochemical fertilizers, to switch to 100% organic agriculture -> failed to maintain the same level of yield -> food shortage/crisis, increase in food prices. **Way Forward** – Structural marketing issues needs to be addressed. – Government should step in & reduce dependence on middle-men. – Andhra Pradesh experience -> suggests the need for public funding. – Paradigm of chemical-based agriculture has failed & regenerative agriculture is the emerging new science. Farmers' ease of doing business & ease of living should also be considered -> to make doubling of farmers' income a reality.	
12.	**Zero tillage**	
	– Zero tilling farming/no-tillage/direct drilling is an agricultural technique for growing crops or pasture without disturbing the soil through tillage. 3 basic methods of zero tillage farming. – "**Sod seeding**" => crops are sown with seeding machinery into a sod produced by applying herbicides on a cover crop (killing that vegetation). – "**Direct seeding**" => crops are sown through the residue of previous crop.	

	– "**Surface seeding**" => crops are left on the surface of the soil; on flats lands -> requires no machinery & minimal labour. **Benefits:** – Soil structure stay intact -> decreases soil erosion. – Increases -> water infiltration into soil, soil retention of organic matter & nutrient cycling. – Reduction in the cost of inputs for land preparation (saves around 80%). – Dry matter & organic matter -> added to the soil. – Greenhouse effect reduced due to carbon sequestration -> Environmentally safe. **Challenges:** - Farmer lost the ability to mechanically control weeds through tillage. – Risk of carrying over plant diseases when crop residue is not incorporated into the soil after harvest -> can act as a host for disease & infect the following crop. – They require proper timing. If the terrains are dry enough -> residues should be removed 1 to 2 weeks before. If the terrains are wet -> should be done right before planting. **Conclusion:** No-till farming -> promising concept in terms of money spent vs. gained. Beneficial to the environment, eliminating the negative impact of farming activities on the environment, climate & earth's overall health.	
13.	**Permaculture**	
	– 'Permaculture' -> **permanent agriculture** or permanent culture -> aims to create sustainable human habitats by following nature patterns. – An ethical design system applicable to food production, land use & community building. – It seeks to create productive & sustainable ways of living by integrating ecology, landscape, organic gardening, architecture & agroforestry. **Benefits** - Intensive permaculture produces up to 35 times the amount of food/square metre (compared to conventional farm), with less than 20% of resources. - According to FAO => currently around 1.4 acres of land is required to sustain 1 person/year in India -> by using permaculture, entire family of 4 persons can be fed on just 1.5 acres of land. – Helps to achieve conservation & sustainability related goals ->	

	since it focuses on protecting natural resources & development of resilient communities. – Offers solutions for soil fertility, water conservation, climate change mitigation & animal habitat -> helps in maximizing biodiversity & preserving wildlife by creating more habitat for animal species. – Helps in saving space with intensive output. **Limitations** – Costly, since it requires adjustments in agricultural processes/infrastructure. – Permaculture leads to short-term losses & long-term benefits -> resulting in problems for farmers. – May not be suitable & sustainable for mass production. – Requires plenty of work to be done & use of fewer machines -> time-intensive. – Lack of knowledge among farmers regarding permaculture. **Conclusion** Although permaculture may not be a short-term solution for all the problems the farmers face, the long-term benefits offered by permaculture may help human society in building a sustainable farming technique for themselves.	
14.	**Vertical farming**	
	– Vertical farming is the practice of **growing crops indoors**, on vertically inclined surfaces, under artificial conditions of light & temperature. – It is done in a controlled environment, with the aim of optimising plant growth. – It aims at higher productivity in smaller spaces & uses soil-less methods such as hydroponics, aquaponics & aeroponics. **Advantages:** – Increased crop yield & smaller unit area of land requirement -> over **10 times the crop yield/acre** than traditional methods. – Crops are resistant to weather disruptions because of their placement indoors -> less crops are lost to extreme/unexpected weather occurrences. – Because of its limited land usage -> vertical farming is less disruptive to the native plants & animals. Traditional farming is often invasive to the native flora & fauna because it requires large area of arable land. – Helps in preventing climate change & conserve the environment. – Produce crops with 70-95% less water than required for normal cultivation. Transpiration -> will be harnessed & reused for irrigation.	

Disadvantages:

- Depends heavily on modern engineering, architecture & different technologies. **Expensive investment & operational costs**.
- Vertical farming in a controlled environment without the presence of insects => needs **manual pollination** process -> labour intensive & costly.
- **Labor Costs**: In vertical farming, labor costs can be even higher due to their concentration in urban centres where wages are higher, as well as the need for more **skilled labor**. Automation in vertical farms, however, may lead to the need for fewer workers.
- Potential for **disrupting the rural sector** -> farmers with no competencies in vertical farming left jobless.

Conclusion

By 2050, around 80% of world population is expected to live in urban areas & growing population -> increase demand for food. Efficient use of vertical farming -> play a significant role in preparing for such a challenge.

15. Precision farming

- Precision agriculture -> where inputs are utilised in precise amounts to get increased average yields, compared to traditional cultivation techniques such as agroforestry, intercropping, crop rotation, etc.
- It uses Information & Communication Technologies (**ICTs**).
- It is based on sustainable agriculture & healthy food production -> consists of profitability, increasing production, economic efficiency & reduction of side effects on the environment.

Benefits:

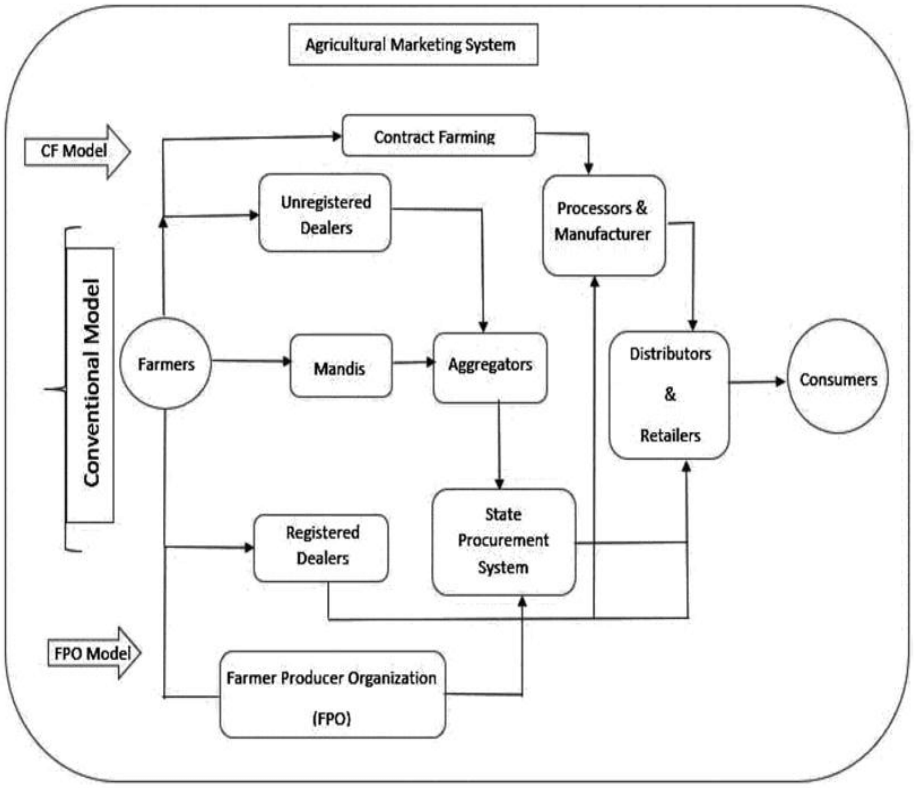
- Increases agriculture productivity.
- Prevents soil degradation.
- Reduces chemical application in crop production.
- Efficient use of water resources.
- Disseminates modern farm practices to improve the quality, quantity and reduced cost of production.
- Changes the socio-economic status of farmers.

Challenges:

- High cost
- Lack of technical expertise knowledge and technology
- Not applicable or difficult/costly for small land holdings

Heterogeneity of cropping systems and market imperfections

16.	**System of Rice intensification**	
	– SRI involves cultivating rice with **as much organic manure** as possible, starting with young seedlings planted singly at wider spacing in a square pattern; and with intermittent irrigation that **keeps the soil moist but not inundated**, and frequent inter cultivation with weeder that actively aerates the soil. – SRI is not a standardised, fixed technological method. – It is rather a **set of ideas**, a methodology for comprehensively managing and conserving resources by changing the way that land, seeds, water, nutrients, and human labour are used to increase productivity from a small but well-tended number of seeds. **Benefits of SRI** – Higher yields – Both grain & straw – Reduced duration (by 10 days) – Lesser chemical inputs & water requirement – Grain weight increased without change in grain size – Higher head rice recovery – Withstand cyclonic gales & Cold tolerance – Soil health improves through biological activity **Disadvantages** – Higher labour costs in the initial years => needs 50% more man-days for transplanting & weeding -> Once the right skills are learnt & implemented -> labour costs will be lesser. – Difficulties in acquiring the necessary skills. Not suitable when no irrigation source available.	
17.	**Process of Agricultural marketing**	
	The process of agricultural marketing begins with the farmer and end up with the consumer. In between these two extreme ends one can find many intermediaries like transporters, warehouse owners, commission agents, wholesalers, retailers etc. performing their duties to enable the agricultural marketing process to reach its completion. **Agricultural marketing process** involves wide variety of functions such as: (i) Assembling (ii) Grading and standardization (iii) Processing and Storage (iv) Transportation (v) Wholesaling and retailing	



18. Problems of current agricultural marketing

1. **Lack of Storage Facility**:
   - There is no proper storage or warehousing facilities for farmers in the villages where they can store their agriculture produce. Every year 15 to 30 per cent of the agricultural produce are damaged either by rats or rains due to the absence of proper storage facilities.
2. **Distress Sale**:
   - Most of the Indian farmers are very poor and thus have no capacity to wait for better price of his produce in the absence of proper credit facilities. Farmers often have to go for even distress sale of their output to the village moneylenders-cum-traders at a very poor price.
3. **Lack of Transportation**:
   - In the absence of proper road transportation facilities in the rural areas, Indian farmers cannot reach nearby mandis to sell their produce at a fair price. Thus, they prefer to sell their produce at the village markets itself.
4. **Unfavourable Mandis**:
   - The condition of the mandis is also not at all favourable to the farmers. In the mandis, the farmers have to wait for disposing their produce for which there is no storage facilities.
5. **Intermediaries**:
   - A large number of intermediaries exist between the cultivator

	and the consumer. All these middlemen and dalals claim a good amount of margin and thus reduce the returns of the cultivators. 6. **Unregulated Market's**: - There are huge number of unregulated markets which adopt various malpractices. Prevalence of false weights and measures and lack of grading and standardization of products in village markets in India are always going against the interest of ignorant, small and poor farmers. 7. **Lack of Market Intelligence**: - There is absence of market intelligence or information system in India. Indian farmers are not aware of the ruling prices of their produce prevailing in big markets. Thus, they have to accept any un-remunerative price for their produce as offered by traders or middlemen. 8. **Lack of Organisation**: - There is lack of collective organisation on the part of Indian farmers. A very small amount of marketable surplus is being brought to the markets by a huge number of small farmers leading to a high transportation cost. 9. **Lack of Grading**: - Indian farmers do not give importance to grading of their produce. They hesitate to separate the qualitatively good crops from bad crops. Therefore, they fail to fetch a good price of their quality product. 10. **Lack of Institutional Finance**: - In the absence of adequate institutional finance, Indian farmers have to come under the clutches of traders and moneylenders for taking loan. After harvest they have to sell their produce to those moneylenders at unfavourable terms.	
19.	**Agricultural Produce Market Committee (APMC)**	
	Intro: – Agricultural Produce Marketing Committee (APMC) Act authorizes the concerned State Governments to notify the commodities, designate markets and market areas **Objectives** – Developing an efficient marketing system. – Promotion of Agri-processing and agricultural exports. – Specify procedures and systems to establish an effective infrastructure for the marketing of agricultural produce. **Model APMC Act 2003 – Salient features:** - As per the act, the State is divided into several market areas, each of which is administered by a separate Agricultural	

	Produce Market Committee (APMC) which impose its **own marketing regulation** (including fees). – Apart from that, legal persons, growers, and local authorities are permitted to apply for the establishment of new markets for agricultural produce in any area. – No compulsion on the growers to sell their produce through existing markets administered by the Agricultural Produce Market Committee (APMC). – Separate provision is made for notification of '**Special Markets'** in any market area for specified agricultural commodities. – **Provision for Contract Farming**, allowing direct sale of farm produce to contract farming sponsor from farmer's field. – Single point levy of market fee on the sale of notified agricultural commodities in any market area. – Provision made for **resolving disputes** arising between private market/ consumer market and Market. – Provides for the creation of marketing infrastructure from the revenue earned by the APMC. **Challenges in Current APMC system:** – **Monopoly of APMC** – It deprives farmers from better customers, and consumers from original suppliers. – **Cartelization** – **Entry Barriers – License fee** in these markets is highly prohibitive. – **High commission, taxes and levies** – Farmers have to pay commission, marketing fee, APMC cess which pushes up costs. **Conclusion:** – Model Agriculture Produce and Livestock Marketing Act-2017 APLM act needs to be adopted.	
20.	**e-NAM – Salient features and benefits**	
	– E-NAM (**National Agriculture Market**) is an online trading platform for agriculture produce aiming to help farmers, traders, and buyers with online trading and getting a better price by smooth marketing. **Salient Features of eNAM** – Enable farmers to showcase their products through their nearby markets and facilitate traders from anywhere to quote price. – e-NAM provides **single window services** for all info: commodity arrivals, quality & prices, buy & sell offers & e-payment settlement directly into farmers account, among other services. – License for the trader, buyers and commission agents can be obtained	

	– Harmonisation of quality standards of agricultural products and infrastructure for quality testing – Additional features include (i) Warehouse based trading facilitate trade based on e-NWR (ii) FPOs can trade their produce from their collection centre **Benefits** – Transparent Online Trading – Real-Time Price Discovery – Better Price Realization for Producers – Reduced Transaction Cost for Buyers – Stable Price and Availability to Consumers – Quality Certification, Warehousing, and Logistics – More Efficient Supply Chain – Payment and Delivery Guarantee – Error Free Reporting of Transactions – Enhanced Accessibility to the Market **Way Forward** – The government should also ensure that farmers adopt this mechanism and do away with their traditional interactions with the traders. – The e-NAM mechanism should include state-of-the-art technologies to enable quick and accurate assaying at a reasonable cost. – Assaying should be made mandatory for transactions under e-NAM. It is necessary to ensure that e-NAM/APMC markets have appropriate storage facilities to provide cost-effective warehousing facilities to farmers to avert distress sale.	
21.	**Farmer Producer Organization**	
	Intro – FPO is a group of farmers that come together to **achieve synergy** in their activities for reducing cost and increasing income. – Small Farmers' Agribusiness Consortium (SFAC) is providing support for the promotion of FPOs. – It is a **registered entity** where farmers are shareholders. – One or more institutions and/or individuals may promote the FPO by way of assisting in mobilization, registration, business planning and operations. – However, **ownership control is always with members** and management is through the representatives of the members. **Government initiatives to promote FPOs** – **Equity Grant Scheme -** operated by the Small Farmers' Agri-Business Consortium (SFAC) - to extend support to the equity	

	base of Farmer Producer Companies (FPCs) by providing matching equity grants up to a maximum of Rs 15 lakh in two tranches. – **Credit Guarantee Scheme -** risk cover to banks that advance collateral-free loans to FPCs up to Rs 1 crore. Only about 1% of registered producer companies have been able to avail the benefits. – **Central Sector Scheme of Formation and Promotion of 10,000 FPOs -** launched by the Ministry of Agriculture & Farmers Welfare to form - implemented by the SFAC, National Cooperative Development Corporation (NCDC), NABARD, NAFED among others. – While adopting a cluster-based approach, the formation of FPOs will be focussed on "One District One Product" for the development of product specialization. **Challenges** – Structural issues - inadequate professional management, lack of technical skills, weak financial status, lack of risk mitigation mechanism, and inadequate access to market and infrastructure – Getting institutional credit is another big problem for FPOs – Fragmented land holding in India – Poor women participation – Isolation of FPOs with various service providers, etc. **Way Forward** Implement the recommendations of **State of India's Livelihood (SOIL) Report 2021:** – Make it easier for FPOs to avail government programs and schemes for providing equity grants and loans. – Enhance Capacity building of FPO members to establish relations with customers, establish internal governance processes among other things. – Land consolidation of FPO members can overcome the constraint of small farm size – Encourage Women farmers to group cultivate for getting better returns. – Banks must frame structured products for lending to FPOs – Link FPOs with various essential service providers like technical service providers, input companies, marketing companies, retailers, etc.	
22.	**Small Farmers' Agribusiness Consortium**	
	Small Farmers' Agribusiness Consortium (SFAC) - a registered society under Department of Agriculture, Cooperation & Farmers' Welfare	

	Main functions of SFAC - Promotion of development of small agribusiness through VCA scheme. - Helping formation and growth of Farmer Producer Organizations (FPOs) / Farmer Producer Companies (FPCs). - Improving availability of working capital and development of business activities of FPOs/FPCs through Equity Grant and Credit Guarantee Fund Scheme. - Implementation of National Agriculture Market (e-NAM) Electronic Trading platform. **Various FPO promotion programmes undertaken by SFAC** - Vegetable Initiative for Urban Cluster (VIUC), - Mission Organic Value Chain Development (MOVCD), National Food for Security Mission (NFSM), - Mission for Integrated Development of Horticulture (MIDH) etc. - SFAC has promoted 910 FPOs in the country out of which 58 FPOs are from Uttar Pradesh.	
23.	**Contract farming – Benefits & Challenges**	
	- Agricultural production (including livestock and poultry) - carried out **based on a pre-harvest agreement** between buyers (such as food processing units and exporters), and producers (farmers or farmer organisations). - Producer can sell the agricultural produce at a specific price in the future to the buyer as per the agreement. - Regulated under the Indian Contract Act, 1872. - The Model APMC (Agricultural Produce Market Committee) Act, 2003 provides specific provisions for contract farming, like compulsory registration of contract farming sponsors and dispute settlement. **Benefits** - Enhances **market linkages** and reduces dependence on middlemen. - Integrate farmers with bulk purchasers including exporters, agro-industries etc. Since the factories will be next to clusters of farms, wastages will be very largely eliminated. - **Better price realization** through mitigation of market and price risks to the farmers. - It facilitates better access to technology, crop diversification, extension services, financing and crop insurance. - Farmers no need to transport their produce to the mandis, as sponsors usually collect the produce from the farm gate. - **Food-processing** will get a boost as an employment generator. - Encourage the new generation to take up farming instead of migrating to cities. - Rural women, instead of being employed as farm labourers will	

work in sorting and grading of fruits and vegetables.
- It also gives farmers an alternative in cases where the procurement mechanism is ineffective.

Challenges
- It can be detrimental by encouraging large **monoculture farming**.
- Dependency of farmers on companies for **seeds and equipment** also needs to be looked at.
- Contracting firms can exploit the monopsony situation to their advantage by **offering lower prices** to farmers.
- Being a State subject, Operationalizing agriculture reforms needs **State cooperation**. Most often, these reforms fall victim to Centre-States political differences.
- Problems faced by growers like undue quality cut on produce by firms, delayed deliveries at the factory, delayed payments, low price and pest attack on the contract crop which raised the cost of production.
- Lack of enforceability of contractual provisions can result in breach of contracts by either party.

Provisions of Model Contract Farming Act, 2018
- Protecting the interests of the farmers, considering them as weaker of the two parties entering into a contract.
- In addition to contract farming, services contracts all along the value chain including pre-production, production and post-production have been included.
- "**Registering and Agreement Recording Committee**" or an "Officer" for the purpose at district/block/ taluka level for online registration of sponsor and recording of agreement provided.
- Contracted produce is to be covered under crop / livestock **insurance** in operation.
- Previously, market fees and other levies are paid to the APMC for contract farming when no services such as market facilities and infrastructure are rendered by them.
- Now Contract framing to be **outside the ambit of APMC Act** as per the recommendation of Committee of State Ministers on Agricultural Reforms
- No permanent structure can be developed on farmers' land/premises
- No right, title of interest of the land shall vest in the sponsor.
- No rights, title ownership or possession to be transferred or alienated or vested in the contract farming sponsor etc.
- **Contract Farming Facilitation Group (CFFG)** for promoting contract farming and services at village / panchayat level provided.
- Accessible and simple dispute settlement mechanism at the lowest level possible provided for quick disposal of disputes.

24.	**Crop Insurance in India**	

Need:

- Erratic Monsoon, High Indebtedness, Loss of Crops, Market Failures and Storage inadequacies are impacting Small and Marginal Farmers (85%)

Advantages of Crop Insurance

1. **Income stability -** assists farmers in managing yield and price risks.
2. **Minimum debts**- Even during crop failure, farmers will condition to repay their loans
3. **Govt burden on Loan Waivers/NPA**
4. **Technological advancement** - Insurance companies can also provide information on how to reduce losses
5. **New agricultural practices** - adopt new agricultural practices→try new measures to protect their crops.

Insurance Schemes:

- Pradhan Mantri Fasal Bima Yojana (PMFBY)
- Weather-based Crop Insurance Scheme (WBCIS)
- Pilot Unified Package insurance scheme (UPIS)
- Coconut Palm insurance scheme (CPIS)

The cropped area under insurance was 26 per cent/ 50% Target

Issues:

- Delayed compensation
- Declining demand for crop insurance among farmers

Insurance Players exit Agri Insurance Segment due to:

- high costs of reinsurance due to erratic weather
- spike in claims
- challenges and delays with crop loss estimation.
- Govt has capped its share at 30%.
- State govt share of Premium not promptly paid

Way forward

- Attitudes and perceptions of various stakeholders on the scalability of Insurance
- Standing Committee on Agriculture recommended a revamped PMFBY from 2022

Conclusion:

Making crop insurance work well is one of the key ways to insulate farmers from volatility in farm incomes and make farming sustainable, especially as India moves ahead with reforming the agriculture sector.

25.	**Agriculture subsidies**	

- Farm subsidies form about **two percent** of India's GDP
- Policy instruments to support farmers in India include
  - subsidised fertiliser, power, agri-credit and crop insurance on the input side
  - loan waivers and MSP for major crops on the output front.

Types

- Price subsidies (MSP, fertilizer, Electricity) – help to fight inflation and price volatility
- DBT
- Income Support – PM KISAN, Telangana's Rythu Bandhu & Odisha's KALIA

Rationale

- Farm subsidies ➞ Access to **quality inputs** such as seeds, fertilizers ➞ Increase in **productivity** ➞ Better **income** to farmers.
- **motivate farmers** to continue farming ensures food security protects rural livelihood

Effectiveness

- **JAM trinity** increased effectiveness of subsidies, removes bogus accounts
- Agricultural input subsidies and the Green Revolution prevented famine
- Equity between rich and poor farmers- makes inputs affordable, enables usage of modern technology- income increases **Ex: Infrastructural subsidies**.
- Helps to change the cropping pattern, promote sustainable practices like crop diversification.
- make farmer equipped with knowledge.
- Help to contain the migration from the agriculture sector to other sectors.

Problems of Subsidies

- Issues in Identification of Beneficiaries, lack of **digital/ financial literacy** in rural areas
- Marginal returns on subsidies are way below those from investments; Agri subsidies > Agri investment by govt
- Rich household benefits more than poor households, not transformed lives of poor
- Price subsidies distort markets -hurts the poor- regressive
- **Non-MSP crops under cultivated**- supply demand mismatch – lack of diversity in food crops – promotes mono cropping
- Leakage, diversion and wastage of govt resources
- Input subsidy, Overutilization of inputs, soil degradation, soil nutrient imbalance, environmental harm, and groundwater

depletion
- misused to gain political mileage during elections

Conclusion
- Rationalizing subsidies, **Kelkar committee** recommended the phased elimination of subsidies and convert them to **capital investments**, need for long term policies on export trade, promotes forward & backward linkages etc.,

26. Minimum Support Price (MSP)

MSP is a form of market intervention by the Government
- to insure agricultural producers against any sharp fall in farm prices during bumper production years.
- to support the farmers from distress sales
- to procure food grains for public distribution.

Benefits
- Incentivize production of a specific food crop which is in short supply.
- Protects farmers from any sharp fall in the market price of a commodity, unwarranted fluctuation in prices
- Ensures that the country's agricultural output responds to the changing needs of its consumers.
  - Ex: The government hiked the MSP of pulses to expand sowing of pulses.
- Higher farm profits will encourage farmers to spend more on inputs, technology etc.,
- Beneficial in transferring incomes to rural areas and to counter farm level inflation.
- Countered the agricultural distress brought on by natural hazards in the country.
- Lack of sufficient penetration of agricultural insurance schemes for farming has made farming a risky profession exposed to weather and price fluctuations.
- Guaranteeing a minimum floor price, Acts as a benchmark for private buyers
- Helps informed decision making

Challenges
- Sharp and frequent increases in MSP can **feed inflation** too.
- MSP is benefiting the large traders rather than farmers. Small farmers do not have enough marketable surpluses.
- Their crop is usually sold to traders at low post-harvest prices in the village itself or the nearest mandi.
  - According to recent research, farmers may typically get as little as 25% of the price that consumers finally pay.

	– The input costs have been rising faster than sale prices -- decreased farmers income – **Economically Unsustainable**: The economic cost of procured rice and wheat >> market price of the same. – Limited Awareness among farmers – Surplus grains produced can't be exported due to WTO norms –	
27.	**WTO and subsidies**	
	WTO's agreement on agriculture was concluded in 1994, and was aimed to remove trade barriers and to promote transparent market access and integration of global markets. **Agreement on agriculture stands on three pillars**: **1. Domestic Support**: It calls for reduction in domestic subsidies that distorts free trade and fair price. – **Aggregate Measurement of Support (AMS)** is to be reduced by 20% over a period of 6 years by developed countries and 13% over a period of 10 years by developing countries. Subsidies are categorized into: • **Green Box**: subsidies that do not distort trade, or at most cause minimal distortion. • **Amber Box**: All domestic support measures considered to distort production and trade (with some exceptions) • **Blue Box**: This is the "amber box with conditions". Such conditions are designed to reduce distortion. **2. Market Access** – Market access requires that tariffs fixed (like custom duties) by individual countries be cut progressively to allow free trade. – It also required countries to remove non-tariff barriers and convert them to Tariff duties. **3. Export Subsidy** – Subsidy on inputs of agriculture, making export cheaper or other incentives for exports such as import duty remission etc are included under export subsidies. – These can result in dumping of highly subsidized (and cheap) products in other country and damage domestic agriculture sector of other country. **India's Position** – Many countries have filed complaints in WTO against various welfare and subsidy programs run by government of India especially MSP and sugar subsidy. E.g., India vs USA case – India has always pointed out the imbalances in the Agreement on Agriculture at the WTO i.e in **favour of developed countries** – historical asymmetries and imbalances must be corrected to ensure a rule-based, fair and equitable order.	

28.	**Revolutions for food security and Poverty Alleviation**	

As per Economic Survey 2021, around 60% of the Indian population is still dependent on Agri sector. Agricultural Revolutions-process of using new methods and techniques in order to increase the yield.

Green Revolution-M. S. Swaminathan

- Adoption of technology, use of high yielding variety (HYV) seeds, mechanized farm tools, irrigation facilities, pesticides and fertilizers
- Leading to an **increase in food grain production**, especially in Punjab, Haryana, and UP
- PDS revamped after GR- **Food security**
- **Issues** of GR- Ecological damage, soil erosion, ground water depletion and pollution
- To address these→**Evergreen revolution**- integration of ecological principles

White Revolution (Op. Flood)- Verghese Kurien

- Transformed India from milk-deficient into the world's largest milk producer
- In 30 years, doubled the milk available per person. **Dairy farming India's largest rural employment generator**
- Reducing seasonal and regional price variations
- ensuring that producers get a major share of the profit - eliminating the middlemen.
- village milk producers' co-operatives, which procure & provide inputs, services, modern management and technology.

Yellow Revolution- Sam Pitroda

- To increase the production of **edible oil** to achieve self-reliance- hybrid seeds, increase in area.
- Targets nine oilseeds - groundnut, mustard, soybean, safflower, sesame, sunflower, etc.
- Incentives to farmers who were also provided processing facilities→ irrigation, fertilizers, pesticides, etc. transportation, MSP, warehousing.
- Launched Oil Technological Mission in 1986.

Blue Revolution:

To develop, promote fisheries to double the farmers' income. keeping in view the sustainability, bio-security. Tapping total fish potential of India on both islands & marine sector & to triple production by 2020

Other Revolutions:

Black Revolution: To increase petroleum production, accelerate the production of ethanol and to mix it with petrol →**biodiesel**. Returns to farmers, supplement scare resources of hydrocarbons, reducing pollutants

	Pink Revolution: Export and production of **meat** in India. → technological revolution in the **poultry** and meat processing sector. **Grey Revolution:** Increased **fertilizer** production →associated with the mal effects of the green revolution of India focusing on what can happen if the new agricultural equipment turns things wrong. **Silver Revolution:** production of **eggs** was increased during the Silver Revolution phase. made possible due to medical science and more protein-rich food for the hens. **Golden Revolution:** This made India world leader in production of **bananas**, **mangoes**, etc. and provided sustainable livelihood and nutrition options. **Brown Revolution:** demand for **coffee** by growing socially responsible and environment-friendly coffee. Related to Visakhapatnam's tribal areas.	
29.	**Public Distribution System**	
	PDS-Food security system to distribute food & other items to India's poor at subsidized rates. Commodities distributed→ wheat, rice, sugar & fuels like kerosene, through network of **fair price shops**. FCI, a govt-owned corporation, procures and maintains the PDS. State Govt→Distribution. Central govt → procurement, storage, transportation, and bulk allocation of food grains **Significance:** – Ensuring Food and Nutritional Security – Helps in stabilizing food prices and making food available to the poor at affordable prices. – Maintaining the buffer stock of food grains in the warehouse→flow of food remains active – Helps in redistribution of grains by supplying food from surplus regions to deficient regions. – The system of MSP and procurement has led to the increase in food grain production. **Shortcomings:** – Rogue dealers swap good supplies received from the FCI with inferior stock and sell privately. Also malpractice, illegal diversions, black marketing – Identification of households & distribution of granted PDS services highly irregular in states – Poor supervision of FPS & lack of accountability – No clarity on which families be included/excluded in BPL list- genuinely poor being excluded – Seasonal migrant workers or those who live in unauthorized colonies suffer.	

	– Many families mortgage ration cards for money. – Performance audit by **CAG** revealed serious shortfall in Govt Storage capacity. **Way forward:** – Aadhar - solving the problem of identification and distribution of PDS services – Alternatives like Cash transfers, Food coupons – Swift implementing of ONOR card scheme – Frequent checks and raids-eliminate bogus cards. – Computerization of the entire process – Use of GPS tech-tracking trucks with PDS goods. – Efficient Grievance redressal mechanism. – Public participation through **social audits** and SHGs, Cooperatives and NGOs-Transparency – Diversifying the food basket according to the local needs, including biofortified food etc.	
30.	**Modernization of PDS**	
	The Public Distribution System (PDS) manage the scarcity of foodgrain, ensure stability in the prices, rationing of foodgrains in case of deficit in supplies. Public distribution system→ "welfare-based" to the presently "**rights-based**" food-security platform governed under the National Food Security Act (NFSA) **GAPS IN THE EARLIER SYSTEM:** – Leakages, pilferages and diversions of food grains at almost every point of the Supply Chain – inclusion & exclusion Errors, exploitation of manual records to gain→duplicate/ fake ration cards. – The manual record keeping →Dealers indulge in malpractices. **BIOMETRIC/ AADHAAR AUTHENTICATION OF BENEFICIARIES AT Fair Price Shops:** Presently almost about 65%-70% of monthly allocated foodgrains distributed to beneficiaries through biometrically/ Aadhaar authenticated ePoS transactions **Utility: systematically** reduce the ghost lifting of highly subsidized foodgrains + increasing the rightful targeting of genuine beneficiaries of the Food Subsidy. **SMS ALERTS TO BENEFICIARIES:** SMSs are also being delivered to beneficiaries in some States/UTs, informing about quantity and expected time of arrival of foodgrains at their FPSs to plan their visit.	

PORTABILITY OF BENEFICIARIES WITHIN STATE:

ePoS installation at FPSs and Aadhaar seeding of beneficiaries with their ration cards, the States/UT

Utility: implementation of the intra-State portability of ration cards

SPECIAL DISPENSATION OF FOODGRAINS:

Some states/UTs have adopted "Special Dispensation of Foodgrains" to **old-age and differently-abled** beneficiaries with no other adult member in the household and are not in position to visit the FPSs.

31. National Food Security Act (NFSA), 2013:

- provide for food and nutritional security→human life cycle approach

Key features:

- **Coverage and entitlement under Targeted Public Distribution System (TPDS):** 50% urban / 75% of the rural population→ 5 kg per person per month→35 kg of food grains per household per month under **Antyodaya Anna Yojana (AAY).**
- **Subsidised prices under TPDS and their revision:**
- For a period of 3/2/1 per kg for rice, wheat and coarse grains.
- **Identification of Households:** determined for each State.
- **Nutritional Support to women and children:** Integrated Child Development Services (ICDS) and Mid-Day Meal (MDM) schemes.
- **Maternity Benefit:** Pregnant women and lactating mothers will also be receiving maternity benefit of Rs. 6,000.
- **Women Empowerment:** eldest woman of the household of age 18 years or above is to be the head of the household.
- **Grievance Redressal Mechanism:** Grievance redressal mechanism available at the District and State levels.
- **Transparency and Accountability**
- social audits and setting up of Vigilance Committees.
- **Food Security Allowance:** In case of non-supply of entitled food grains or meals, there is a provision for food security allowance to entitled beneficiaries.

Challenges in the Implementation of NFSA

- Effect of **population increase** and availability of foodgrains
- **Identifying the beneficiaries:**
- specific guidelines for identifying Rural/urban beneficiaries
- **Operational inefficiencies in PDS:**
- The **supply chain** of foodgrains distribution are procurement, storage, transportation and distribution –operational inefficiencies occur.

32.	ECONOMICS OF ANIMAL REARING	

Intro:

- Animal rearing is considered an integral part of agricultural activities in rural India →provides non-farm employment and income in rural areas.

Significance of animal rearing in India

- animal rearing, 40% of the rural GDP across India.
- arid and semi-arid regions of India, agriculture is possible only for three to six months
- high-cost irrigation investments are beyond the reach of most the farmers.

Livestock census:

- India→ World's highest livestock 1st in buffalo population – 2nd Goats, Poultry, Fishing,3rd in Sheep

Importance of animal rearing in farmers' economy

- **Food Security**
  The livestock provides food items such as Milk, Meat, and Eggs for human consumption
- **Fibre and skins:**
  Leather is the most important product which has very high export potential.
- **Animals for agricultural operations and transport→** The bullocks are saving a lot on fuel →hilly terrains→mules and ponies
- **Animal waste**: Dung and other animal wastes serve as very good farm yard
- **Livestock as asset**: Livestock is considered as 'moving banks' Capital of landless agricultural laborers
- **Weed control**: cattle graze off the weeds.

Socio-cultural importance

- They have been responsible for developing and conserving domestic animal diversity with important genetic traits
- **Milk marketing network**
- The sale of milk does help family farms to get regular income, though not high profits

Important Initiatives by the Government

- **Rashtriya Gokul Mission:** develop and conserve indigenous breeds of the bovine population and enhance milk production
- **National Livestock Mission** capacity building of all stakeholders.
- **National Artificial Insemination Programme**
- **National Cattle and Buffalo Breeding Project:** upgrade important indigenous breeds

	– **Animal Husbandry Startup Grand Challenge**: innovations coming from the villages to expand the dairy sector in India. **Way forward** – incorporating seeds that yield good edible biomass in our agricultural practices; – Right cattle/ buffalo breeds in different agro-climatic regions; Eg: In western India, high-yielding milk breeds can be used in pure form – promoting milk recording at farmers' gate; – promoting milk yield competitions in different regions for identifying good milk-yielding cows	
33.	**INTEGRATED FARMING SYSTEM**	
	The Integrated Farming System (IFS) is a combined approach or sustainability, food security, farmer's security and poverty reduction by involving livestock, vermicomposting, organic farming etc. **Integrated Farming System ensures sustainable agricultural production through:** – **Economic activity:** IFS provides an opportunity to increase economic yield --intensification of crop and allied enterprises FOR Small and Marginal→ – **Employment and Labour** – **Reduced use of fertilisers:** fertilisers and recycling nutrients. – **Environmentally sustainable:** Eg: integrated pest management and – **Recycling:** by-products and waste material – **Resource management:** rejuvenation of systems productivity and to achieve agroecological equilibrium. **Challenges:** – **Affordability**: small and marginal farmers cannot afford large cattle – **Acceptance:** hesitation among the farmers especially fisheries, poultry, duck rearing because of lack of role models and religious perceptions. – **Not under MSP:** Mushroom farming and beekeeping are not covered under the Minimum Support Price (MSP) system. **Way forward:** – Better integration with the food processing industries – **Integrating subsistence agriculture:** Eg in NER→Encouraging livestock enterprises – **Building farmer capacities:** eco-friendly and self-sustaining integrated farming systems.	

Conclusion:

– IFS provides multiple benefits that are sustainable and can pave the way for climate-smart agriculture. India needs to adopt a "well designed" Integrated Farming System (IFS) to realise the vision of doubling farmers' income by 2022 and having sustainable agricultural practices.

34. Food Processing

Scope:

– India produces nearly 16% of the world's total food grain production
- Huge domestic market
- Abundant raw material.
- Changed consumption pattern.
- Penetration of food retailers.
- Export opportunities.
- Proactive government policy.

Significance of food processing:

Economic significance:

- Employment generation.
- Farmers income.
- Increase in exports.
- Curbing food inflation.
- Crop diversification.

Social significance:

- Reduce malnutrition.
- Reduce food wastage.
- Curbing migration.
- Preserve nutritive quality.
- Consumer choices.
- Gender empowerment.

Supply chain management:

A supply chain is an entire system of producing and delivering a product from sourcing a raw material to the final delivery of the product.

Upstream requirement:

- Accessibility to raw materials.
- Modern extraction technique.
- Good linkage with farmers.
- Storage facility.
- Transport facility.

Downstream requirement:

- Processing techniques.
- Quality testing
- Retail source.

Challenges:

Supply side issues

- Quality of food.
- Low value addition.
- Availability of raw materials.
- Poor marketing.

Infrastructure related issues.

- Lack of supply chain infra.
- Cold chain capacity low.

Demand side issues.

- Low consumer awareness
- Social perception.
- Ministry of Food Processing Industries has identified six key challenges faced by the food processing industry: (i) gaps in supply chain infrastructure (i.e., lack of primary processing, storage and distribution facilities); (ii) inadequate link between production and processing; (iii) seasonality of operations and low capacity utilisations; (iv) institutional gaps in supply chain, viz., dependence on APMC markets, etc.; (v) inadequate focus on quality and safety standards; and (vi) lack of product development and innovation

Government schemes and measures:

- National mission on food processing.
- 100 FDI in marketing of food products
- Dairy processing industry fund.
- Agri export zones.
- PM kisan SAMPADA yojana.
- Mega food parks scheme.
- Operation greens.