



Global Food Policy Report: IFPRI

For Prelims: Climate Change, International Food Policy Research Institute (IFPRI),

For Mains: Issue of Climate Change and Food Systems.

Why in News?

Recently, the International Food Policy Research Institute (IFPRI) has released **Global Food Policy Report: Climate Change & Food Systems**, showing India's risk for hunger could increase 23% by 2030 due to Climate Change.

What are the Findings?

▪ India:

- India's food production could drop 16% and the number of those at risk for hunger could increase 23% by 2030 due to climate change.
 - Projections are part of a model that was used to evaluate the impact of climate change on aggregate food production, food consumption(kcal per person per day), net trade of major food commodity groups, and the population at risk of going hungry.
- The number of Indians **at risk from hunger in 2030 is expected to be 73.9 million in 2030** and, if the effects of climate change were to be **factored in, it would increase to 90.6 million.**
- The aggregate food production index would, under similar conditions, drop from 1.6 to 1.5.
 - Food production index covers food crops that are considered edible and that contain nutrients. Coffee and tea are excluded because, although edible, they have no nutritive value.
- On a positive note, **climate change will not impact the average calorie consumption of Indians** and this is projected to remain roughly the same at 2,600 kcal per capita per day by 2030 even in a climate change scenario.
- The average temperature across India is projected to rise by between 2.4°C and 4.4°C by 2100. Similarly, summer heat waves are projected to triple by 2100 in India.

▪ Global:

- Baseline projections indicate that **global food production will grow by about 60% over 2010 levels by 2050** in the context of climate change.
- Production and demand are projected to grow more rapidly in developing countries, particularly in Africa, than in developed countries, due to projected growth in population and incomes.
- Diets are also shifting toward higher-value foods, including more fruits and vegetables, processed foods, and animal-source foods, outside of high-income countries.
- Meat production is projected to double in South Asia and West and Central Africa by 2030 and triple by 2050.
- Despite this growth, **per capita consumption levels in developing countries will remain less than half of those in developed countries.**
- The **demand for processed foods also shows up in the growing production of oil**

crops: by 2050 production is expected to more than double in Southeast Asia and West and Central Africa.

How food production impacts climate change?

- Food system activities, including producing food, transporting it, and storing wasted food in landfills, produce [Greenhouse Gas \(GHG\) Emissions](#) that contribute to climate change.
- Of these sources, **Livestock production is the largest, accounting for an estimated 14.5 % of global GHG emissions** from human activities.
 - Meat from ruminant animals, such as cattle and goats, **are particularly emissions-intensive.**
- If global trends **in meat and dairy intake continue, our chances of staying below the 2° Celsius threshold will still be extremely slim.**
- This is why **urgent and dramatic reductions in meat and dairy consumption, alongside reductions in GHG emissions from energy use, transportation, and other sources, are crucial to avoiding catastrophic climate change.**
- The responsibility for eating lower on the food chain falls most heavily on countries like the U.S. with the highest per capita consumption of meat and dairy. Changing diets on an international scale will require more than just educating consumers – national policies will need to shift in ways that support more plant-centric diets.

What are the Recommendations of Global Food Policy Report?

- **Investment in Research and Development:**
 - There is a need for **more investment in research and development for “disruptive” technology innovations, such as in irrigation systems and the cold chain, which “could accelerate sustainable food systems transformation.”**
 - **Public investment in such innovations should be doubled** from current levels, ensuring at least \$15 billion goes toward food systems in low- and middle-income countries.
- **Management of Land and Water Resources:**
 - There must be **improved management of land and water resources.**
 - Policy should ensure **there are no “undesirable trade-offs” in development goals,** finding a balance between the additional energy required to increase productivity while not contributing further to fossil fuel emissions.
- **Healthy Diets and Sustainable Food Production:**
 - Healthy diets and sustainable food production **must also be prioritized.**
 - Reducing consumption of highly processed foods and red meats **will improve food’s ecological footprint.**
- **Efficient Value Chain:**
 - Value chains need to be made more efficient and support “free and open” trade, which the report calls “an integral part of climate-smart agricultural and food policies.”
- **Social Protection:**
 - Social protection **programs must guard poor rural populations,** which make their living from agriculture, against the worst effects of climate change.
 - These **programs are “another way to deal with the more uncertain future** that we expect.
- **Financing Sustainable Production:**
 - The report stresses the importance of adequately financing a shift to more sustainable production and consumption while increasing livelihoods.

What is International Food Policy Research Institute?

- Established in 1975, IFPRI provides **research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition in developing countries.**
- IFPRI’s vision **is a world free of hunger and malnutrition.**
- It focuses on **five strategic research areas:**
 - Fostering Climate-Resilient and Sustainable Food Supply.

- Promoting Healthy Diets and Nutrition for All.
- Building Inclusive and Efficient Markets, Trade Systems, and Food Industry.
- Transforming Agricultural and Rural Economies.
- Strengthening Institutions and Governance.

UPSC Civil Services Examination, Previous Year's Question (PYQs)

Q. Which of the following is/are the indicator/indicators used by IFPRI to compute the Global Hunger Index Report? (2016)

1. Undernourishment
2. Child stunting
3. Child mortality

Select the correct answer using the code given below:

- (a) 1 only
- (c) 1, 2 and 3
- (b) 2 and 3 only
- (d) 1 and 3 only

Ans: (c)

Explanation:

- International Food Policy Research Institute (IFPRI) was established in 1975 which provides researchbased policy solutions to sustainably reduce poverty and end hunger and malnutrition in developing countries.
- Global Hunger Index (GHI) is a tool designed to comprehensively measure and track hunger at global, regional, and national levels. GHI scores are calculated each year to assess progress and setbacks in combating hunger.
- Dimensions of GHI
 - Inadequate food supply
 - Child mortality
 - Child under-nutrition
- Indicators of GHI
 - Undernourishment (inadequate food supply); Hence, 1 is correct.
 - Under 5 mortality rate (child mortality) ; hence, 3 is correct.
 - Wasting;
 - Stunting (child under-nutrition); hence, 2 is correct.
 - Therefore, option (c) is the correct answer.

[Source: TH](#)

Cryptocurrency

For Prelims: Cryptocurrency, Bitcoin, Blockchain

For Mains: Cryptocurrency & Related Issues, Government Policies & Interventions

Why in News?

Recently, the **Central African Republic (CAR)** became the second country after El Salvador to adopt [Bitcoin](#) as legal tender.

- The [Union Budget 2022-2023](#) of India has also proposed to introduce a digital currency in the coming financial year.
- It was also announced that “any income from transfer of any virtual digital asset shall be taxed at the rate of 30%.”

What is Cryptocurrency?

- [Cryptocurrency](#), sometimes called crypto-currency or crypto, is any form of currency that **exists digitally or virtually** and uses cryptography to secure transactions.
- Cryptocurrencies don't have a central issuing or regulating authority, instead use a decentralized system to record transactions and issue new units.
 - It is supported by a decentralized peer-to-peer network called the [blockchain](#).

What are the Benefits Associated with Cryptocurrency?

- **Fast and Cheap Transactions:** Cryptocurrencies are way cheaper to use to execute international transactions because the transactions don't have to be handled by a series of intermediaries before they reach their destinations.
- **Investment Destination:** There is a limited supply of cryptocurrency – partially like gold. Moreover, the last few years have seen the price of cryptocurrencies rising faster than other financial instruments.
 - Due to this, cryptocurrencies can become a preferred investment destination.
- **Anti-Inflationary Currency:** Due to the high demand for cryptocurrency its prices have largely remained on a growing trajectory. In this scenario, people tend to hold more cryptocurrency than spending it.
 - This will cause a deflationary effect on the currency.

Why are Countries like CAR Adopting Cryptocurrencies as a Legal Tender?

- **Strong and Inclusive Growth:** The measure would enable “strong and inclusive growth” and place the African country on the “map of the most courageous and visionary countries in the world”.
 - Having a population of 5 million, CAR is **among the poorest and most economically fragile countries globally**.
 - As per the World Bank estimates provided in July 2021, 71% of its population was living below the international poverty line of USD 1.90/day.
- **Positive Growth:** There is potentially a direct relationship between inflation and countries permitting the use of cryptocurrencies.
 - Cryptocurrencies bear the potential to **convert inflation-related decline from legal currencies into positive growth**.
 - This potentially direct relationship would be relevant for CRA. As per the IMF, inflation in the country is **expected to accelerate to 4% in 2022** because of rising food and fuel prices.

How is this About Geopolitics?

- **Dependency on the Other Country:**
 - The two countries that regularised Bitcoin as a legal tender **do not have a currency of their own.**
 - El Salvador uses the US dollar and CAR's franc is the mutual currency for 14 African nations. Together these countries—most of which were once French colonies constitute the '**Franc Zone**'.
 - Franc can be exchanged into foreign currencies via the exchange market of Paris which creates a dependency on the European country.
- **Circumvent the Sanctions and Embargos Imposition:**
 - As a consequence of the blockade imposed by the U.S., countries such as **Cuba are cut off from global financial systems** and cannot acquire financial instruments such as debit or credit cards, in turn, struggling to go abroad and obtain materials and services from outside.

What are the Drawbacks?

- **Extremely Volatile:** Cryptocurrencies are highly volatile assets and have acquired popularity for their unregulated nature and the risk of volatility has established concerns over the potential impact on a country's macroeconomic stability, especially those with weak socio-economic fundamentals.
 - Recently, several countries have considered **instituting laws that regulate the use of cryptocurrencies**, particularly those not having well-devised currency mechanisms and experiencing prolonged inflation.
- **Unregulated Nature:** [International Monetary Fund](#) (IMF) had also urged El Salvador to limit the scope of unregulated assets as there are large risks associated with the use of Bitcoin on financial stability, financial integrity, and consumer protection, as well as the associated fiscal contingent liabilities.
- **Paying Taxes in Cryptocurrencies:** For countries like CRA, risks associated with paying taxes in cryptocurrencies would be exposed when taxes are paid using crypto assets but expenditures remain in local currency.
 - For example, the government collects \$100 worth taxes using crypto denominations, but a downward slide of the asset makes available \$40 to spend.
- **Not a Definite Mechanism:** Unlike equities or currencies, cryptos are not subject to a definite mechanism and are speculative assets, therefore, central banks would not have any reference point to devise their interest rates in accordance with their domestic requirements.
- **Counterproductive Utility:** Blockchains may help trace the transactions but not the parties involved. Hence, it could potentially be used for money laundering, terrorist financing, or other illegal activities.

UPSC Civil Services Examination, Previous Year's Questions (PYQs)

Q. With reference to 'Bitcoins', sometimes seen in the news which of the following statements is/are correct? (2016)

1. Bitcoins are tracked by the Central Banks of the countries.
2. Anyone with a Bitcoin address can send and receive Bitcoins from anyone else with a Bitcoin address.
3. Online payments can be sent without either side knowing the identity of the other.

Select the correct answer using the code given below:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 3 only
- D. 1, 2 and 3

Ans: B

[Source: TH](#)

Fertiliser Challenge

For Prelims: Zero-budget farming, New Urea Policy (NUP) 2015, DBT, NBS Scheme

For Mains: Fertiliser Challenge, Impact of Pandemic on Fertiliser Supply

Why in News?

India is facing the challenge of meeting its requirement of fertilizer supply which has been disrupted ahead of kharif sowing in the wake of [Russia's invasion of Ukraine](#).

How much fertilizer does India consume?

▪ About:

- India consumed about 500 LMT of fertilizer per year in the last 10 years.
- The **Centre's fertiliser subsidy bill is set to soar by 62% over the budgeted amount** to Rs 1.3 lakh crore in FY21.
 - Since **non-urea (MoP, DAP, complex) varieties cost higher**, many farmers prefer to use more urea than actually needed.
 - The government has **taken a number of measures to reduce urea consumption**. It introduced neem-coated urea to reduce illegal diversion of urea for non-agricultural uses. It also stepped up the promotion of organic and [zero-budget farming](#).
- Between 2018-19 and 2020-21, India's fertiliser imports **increased almost 8% to 20.33 million tonnes** from 18.84 million tonnes.
 - In FY21, **more than a fourth of the urea requirement was imported**.
- India, the **top importer of urea, is a major buyer of Diammonium Phosphate (DAP)** needed to feed its huge agriculture sector which employs about 60% of the country's workforce and accounts for 15% of USD2.7 trillion economy.

▪ Need of Large Quantities of Fertilisers:

- The **agricultural output of India has increased every year**, and the country's need for fertilisers has also increased.
- Despite imports, gaps remain between requirements and availability after indigenous production targets haven't been met.

What is Fertilizer Subsidy?

▪ About:

- The government **pays a subsidy to fertiliser producers** to make this critical ingredient in agriculture affordable to farmers.
- This allows **farmers to buy fertilisers at below-market rates**.
 - The difference between the cost of production/import of a fertiliser and the actual amount paid by farmers is the subsidy portion borne by the government.

- **Subsidy on Urea:** The Centre [pays subsidy](#) on urea to fertiliser manufacturers on the basis of cost of production at each plant and the units are required to sell the fertiliser at the government-set Maximum Retail Price (MRP).
- **Subsidy on Non-Urea Fertilisers:** The MRPs of non-urea fertilisers are decontrolled or fixed by the companies. The Centre, however, pays a flat per-tonne subsidy on these nutrients to ensure they are priced at “reasonable levels”.
 - **Examples of non-urea fertilisers:** Di-Ammonium Phosphate (DAP), Muriate of Potash (MOP).
 - All Non-Urea based fertilisers are regulated under Nutrient Based Subsidy Scheme.

What has been the Impact of Pandemic on Fertiliser Supply?

- The pandemic has **impacted fertiliser production, import and transportation** across the world during the last two years.
- China, who is the **major fertiliser exporter**, has **gradually reduced their exports in view of a dip in production**.
 - This has **impacted countries such as India**, which sources 40–45% of its phosphatic imports from China.
- Besides, **there has been a surge in demand in regions** like Europe, America, Brazil and Southeast Asia.
- Demand has increased, but **supply has been constrained**.

What are the Related Government Initiatives and Schemes?

- **Neem Coating of Urea:**
 - The Department of Fertilizers (DoF) has **made it mandatory for all the domestic producers** to produce 100% urea as **Neem Coated Urea (NCU)**.
 - The benefits of use of NCU are as under:-
 - Improvement in soil health.
 - Reduction in usage of plant protection chemicals.
 - Reduction in pest and disease attack.
 - An increase in yield of paddy, sugarcane, maize, soybean, Tur/Red Gram.
 - Negligible diversion towards non-agricultural purposes.
 - Due to slow release of Nitrogen, Nitrogen Use Efficiency (NUE) of Neem Coated Urea increases resulting in reduced consumption of NCU as compared to normal urea.
- [New Urea Policy \(NUP\) 2015:](#)
 - Objectives of the policy are-
 - To maximize indigenous urea production.
 - To promote energy efficiency in the urea units.
 - To rationalize the subsidy burden on the Government of India.
- **New Investment Policy- 2012:**
 - The Government announced New Investment Policy (NIP)-2012 in January, 2013 and made amendments in 2014 to facilitate fresh investment in the urea sector and to make India self-sufficient in the urea sector.
- **Policy on Promotion of City Compost:**
 - Approved a policy on promotion of City Compost, notified by the DoF in 2016 granting Market Development Assistance of Rs. 1500/- for scaling up production and consumption of city compost.
 - **To increase sales volumes, compost manufacturers** willing to market city compost were allowed to sell city compost in bulk directly to farmers.
 - Fertilizer companies marketing city compost are covered under the [Direct Benefit Transfer \(DBT\)](#) for Fertilizers.
- **Use of Space Technology in Fertilizer Sector:**
 - DoF commissioned a **three year Pilot Study on “Resource Mapping of Rock Phosphate using Reflectance Spectroscopy and Earth Observations Data”** by National Remote Sensing Centre under [ISRO](#), in collaboration with Geological Survey of India (GSI) and the Atomic Mineral Directorate (AMD).
- **The Nutrient Based Subsidy (NBS) Scheme:**

- It has been implemented from **April 2010 by the DoF**.
- Under [NBS](#), **a fixed amount of subsidy decided on an annual basis**, is provided on each grade of subsidized Phosphatic & Potassic (P&K) fertilizers depending on its nutrient content.
- It aims at **ensuring the balanced use of fertilizers**, improving agricultural productivity, promoting the growth of the indigenous fertilizers industry and also reducing the burden of Subsidy.

UPSC Civil Services Examination, Previous Year's Question (PYQs)

Q. With reference to chemical fertilizers in India, consider the following statements: (2020)

1. At present, the retail price of chemical fertilizers is market-driven and not administered by the Government.
2. Ammonia, which is an input of urea, is produced from natural gas.
3. Sulphur, which is a raw material for phosphoric acid fertilizer, is a by-product of oil refineries.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 2 only
- (d) 1, 2 and 3

Ans: (b)

- The Government of India subsidizes fertilizers to ensure that fertilizers are easily available to farmers and the country remains self-sufficient in agriculture production. The same has been achieved largely by controlling the price of fertilizer and the amount of production. Hence, statement 1 is not correct.
- Ammonia (NH₃) has been synthesized from natural gas. In this process, natural gas molecules are reduced to carbon and hydrogen. The hydrogen is then purified and reacted with nitrogen to produce ammonia. This synthetic ammonia is used as fertilizer, either directly as ammonia or indirectly after synthesis as urea, ammonium nitrate, and monoammonium or diammonium phosphates. Hence, statement 2 is correct.
- Sulfur is a major by-product of oil refining and gas processing. Most crude oil grades contain some sulfur, most of which must be removed during the refining process to meet strict sulfur content limits in refined products. This is done through hydrotreating and results in production of H₂S gas, which is converted into elemental sulfur. Sulfur can also be mined from underground, naturally-occurring deposits, but this is more costly than sourcing from oil and gas and has largely been discontinued. Sulfuric acid is used in the production of both Monoammonium Phosphate (MAP) and Diammonium Phosphate (DAP). Hence, statement 3 is correct. Therefore, option (b) is the correct answer

Source: IE

MoU for Strategic Partnership on Agriculture, Crop Insurance and Credit

For Prelims: PMFBY scheme & Kisan Credit Card Scheme, UNDP, Aadhaar seeding.

For Mains: PMFBY scheme and its benefits, Kisan Credit Card Scheme, Crop Insurance.

Why in News?

Recently, the Ministry of Agriculture & Farmers Welfare (MoA&FW) and the [United Nations Development Programme \(UNDP\)](#) have signed a Memorandum of Understanding (MoU).

What is the Purpose of the MoU?

- UNDP will **provide technical support towards Centre's aspirational [Pradhan Mantri Fasal Bima Yojana \(PMFBY\) scheme](#) & [Kisan Credit Card Scheme](#).**
- Under the MoU, **UNDP will leverage its expertise in systems** and global know-how for supporting the Ministry of Agriculture for the implementation of combined agriculture credit and crop insurance.

What is the PMFBY scheme?

- **Pradhan Mantri Fasal Bima Yojana (PMFBY):**
 - **About:**
 - It provides a **comprehensive insurance cover against failure of the crop** thus helping in stabilising the income of the farmers.
 - The scheme was **compulsory for loanee farmers availing Crop Loan/Kisan Credit Card (KCC)** account for notified crops and voluntary for others.
 - **Scope:** **All food & oilseed crops** and annual commercial/horticultural crops for which past yield data is available.
 - **Premium:** The **prescribed premium is 2%** to be paid by farmers for all Kharif crops and 1.5% for all rabi crops. In the case of annual commercial and horticultural crops, the premium is 5%.
 - **Premium cost over** and above the farmer share was equally subsidized by States and Gol.
 - However, **Gol shared 90% of the premium subsidy** for North Eastern States to promote the uptake in the region.
- **Coverage:**
 - The **Scheme covers over 5.5 crore farmer applications** on average per year.
 - [Aadhar seeding](#) (linking Aadhaar through Internet banking portals) has helped in speedy claim settlement directly into the farmer accounts.
 - One notable example is **mid-season adversity claims** of nearly Rs. 30 crore in Rajasthan during Rabi 2019-20 [Locust attack](#).
- **PMFBY 2.0:**
 - In order to **ensure more efficient and effective implementation of the scheme**, the central government had revamped PMFBY in the 2020 Kharif season.
 - This overhauled PMFBY is often called [PMFBY 2.0](#), it has the following features:
 - **Completely Voluntary:** Enrolment 100% voluntary for all farmers from 2020 Kharif.
 - **Limit to Central Subsidy:** The Cabinet has **decided to cap the Centre's premium subsidy** under the scheme for premium rates up to 30% for unirrigated areas/crops and 25% for irrigated areas/crops.
 - **More Flexibility to States:** The government has **given the flexibility to states/UTs to implement PMFBY** and given them the option to select any number of additional risk covers/features.

- **Investing in ICE Activities:** Insurance companies have to **now spend 0.5% of the total premium collected** on information, education and communication (IEC) activities.

- **Use of Technology under PMFBY:**

- **Crop Insurance App:**

- Provides for easy enrollment of farmers.
 - Facilitate easier reporting of crop loss within 72 hours of occurrence of any event.

- **Latest Technological Tools:**

- To assess crop losses, satellite imagery, remote-sensing technology, [drones](#), [artificial intelligence](#) and machine learning are used.

- **PMFBY Portal:**

- For integration of land records.

What is a Kisan Credit Card Scheme?

- **About:**

- It was introduced in 1998 for **providing adequate and timely credit support** from the banking system under a single window with flexible and simplified procedures to the farmers for their cultivation and other needs like purchase of agriculture inputs such as seeds, fertilizers, pesticides etc. and draw cash for their production needs.
 - The scheme was further extended in the year 2004 for the investment credit requirement of farmers viz allied and non-farm activities.

- **Objectives:**

- Kisan Credit Card is provided with the following objectives:
 - The short term credit requirements for cultivation of crops;
 - Post harvest expenses
 - Produce marketing loan; Consumption requirements of farmer household
 - Working capital for maintenance of farm assets and activities allied to agriculture, like dairy animals, inland fishery, etc.
 - Investment credit requirement for agriculture and allied activities like pumpsets, sprayers, dairy animals, etc.
 - However, this segment forms the long term credit limit portion.

- **Implementing Agency:**

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- The Kisan Credit Card Scheme is implemented by **Commercial Banks, RRBs, Small Finance Banks and Cooperatives**.
 - The short term credit support is **not given to farmers for Purchase of combine harvesters, tractors and mini trucks and Construction of family house and setting up of village cold storage facility**.

Achievements

- As part of the Atmanirbhar Bharat Package, the Government has announced to cover 2.5 crore farmers under the Kisan Credit Card (KCC) scheme with a credit boost of Rs. 2 lakh crores through a special saturation drive.

UPSC Civil Services Examination, Previous Year's Question (PYQs)

Q. Under the Kisan Credit Card scheme, short-term credit support is given to farmers for which of the following purposes? (2020)

1. Working capital for maintenance of farm assets
2. Purchase of combine harvesters, tractors and mini trucks
3. Consumption requirements of farm households

4. Post-harvest expenses

5. Construction of family house and setting up of village cold storage facility

Select the correct answer using the code given below:

(a) 1, 2 and 5 only

(b) 1, 3 and 4 only

(c) 2, 3, 4 and 5 only

(d) 1, 2, 3, 4 and 5

Ans: (b)

Source: PIB

Hypertension

For Prelims: Non-Communicable Diseases, IHCI, Hypertension.

For Mains: Health, Concerns related to High Blood Pressure.

Why in News?

According to a project called the [India Hypertension Control Initiative \(IHCI\)](#), **nearly 23% out of 2.1 million Indians** have uncontrolled blood pressure.

- Managing blood pressure for 2.5 crore individuals can prevent up to five lakh deaths due to cardiovascular disease in the next 10 years.

What is Hypertension?

▪ About:

- Blood pressure is the **force exerted by circulating blood** against the walls of the body's arteries, the major blood vessels in the body.
 - Hypertension is **when blood pressure is too high**.
- It is defined as **having systolic blood pressure level greater than or equal to 140 mmHg** or diastolic blood pressure level greater than or equal to 90 mmHg or/and taking anti-hypertensive medication to lower his/her blood pressure.

▪ Prevalence:

- **Southern States have a higher prevalence** of hypertension than the national average.
 - **Kerala** (32.8% men and 30.9% women) has the **highest number followed by Telangana**.
- 21.3% of women and 24% of men aged above 15 have hypertension in the country.

▪ WHO Response:

- In 2021, the [World Health Organization \(WHO\)](#) released a new guideline on the

pharmacological treatment of hypertension in adults.

- The publication **provides evidence-based recommendations** for the initiation of treatment of hypertension, and recommended intervals for follow-up.

What is the IHCI?

- The programme was launched in **November 2017**.
- In the first year, **IHCI covered 26 districts** across five States — Punjab, Kerala, Madhya Pradesh, Telangana, and Maharashtra.
- By December 2020, IHCI was **expanded to 52 districts across ten States** — Andhra Pradesh, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Telangana and West Bengal.
- The Health Ministry, the [Indian Council of Medical Research](#), State Governments, and WHO-India began a **five-year initiative** to monitor and treat hypertension.
- India has committed to a **"25 by 25" goal**.
 - The goal **aims to reduce premature mortality** due to [Non-Communicable Diseases \(NCDs\)](#) by 25% by 2025.
 - One of the nine voluntary targets includes reducing the prevalence of high blood pressure by 25% by 2025.

[Source: TH](#)

Excavations of Iron in Tamil Nadu

For Prelims: Iron Age, Palaeolithic age, Mesolithic Age, Neolithic Age, Megalithic culture, carbon dating

For Mains: Ancient Indian Civilizations

Why in News?

Recent **carbon dating** of excavated finds in Tamil Nadu pushes evidence of **iron being used in India back to 4,200 years ago**.

- Before this, the **earliest evidence of iron use was from 1900-2000 BCE** for the country, and from 1500 BCE for Tamil Nadu.
- The latest evidence dates the findings from Tamil Nadu to 2172 BCE.

What are the Findings?

- The **excavations are from Mayiladumparai** near Krishnagiri in Tamil Nadu.
- **Mayiladumparai is an important site** with cultural material dating back between the Microlithic (30,000 BCE) and Early Historic (600 BCE) ages.
- Among the other important findings is **evidence that the late Neolithic phase in Tamil Nadu has been identified** to have begun before 2200 BCE, based on a cultural deposit of 25 cm below the dated level.
 - Archaeologists also found that **black and red ware pottery was introduced in the late Neolithic phase itself**, rather than the widely held belief that this occurred in the **Iron Age**.

What is the Historical Significance?

▪ **Production of Agricultural Tools:**

- Invention of iron technology led to the **production of agricultural tools and weapons**, leading to production required for a civilisation ahead of economic and cultural progress.
 - There is **no known record of iron** being used in the Indus Valley, where copper was first utilized by Indians (1500 BCE).

▪ **Useful in Deforestation:**

- Deforestation occurred **only after humans began using iron tools to clear dense forests** and bring land into agriculture, because copper tools would have been difficult to use to clear dense forests and bring land into agriculture.

▪ **Socio-economic Changes:**

- With the **latest evidence tracing our Iron Age to 2000 BCE from 1500 BC**, it can be assumed that the cultural seeds were laid in 2000 BCE.
- Around 600 BCE, iron technology led to massive production triggered by socio-economic changes - the **Tamil Brahmi script**.
 - The Tamil Brahmi scripts were **once believed to have originated around 300 BCE**, until a landmark finding in 2019 pushed the date back to 600 BCE.
 - This dating narrowed the gap between the Indus Valley civilisation and Tamilagam/South India's Sangam Age.

Stone Ages

▪ **Palaeolithic (Old Stone) Age:**

- Basically a **hunting and food gathering culture**.
- **Palaeolithic tools** include sharpened stone, chopper, hand axe, scraper, spear, bow and arrow, etc. and were generally made up of hard rock quartzite.
- Rock paintings and carvings found at Bhimbetka, Madhya Pradesh reflect upon hunting as the main subsistence activity.
- Palaeolithic age in India is **divided into three phases**: Early or Lower Palaeolithic (50,000 – 100,000 BC), Middle Palaeolithic (100,000 – 40,000 BC) and Upper Palaeolithic (40,000 – 10,000 BC).
- Homo sapiens mark their presence in upper palaeolithic age.

▪ **Mesolithic (Middle Stone) Age:**

- The age is marked by **transition from Pleistocene period to Holocene period** and favorable changes in the climate.
- The early period of Mesolithic age marks the hunting, fishing and food gathering.
- Domestication of the animals began in this age.
- The tools called Microliths were smaller and had improved geometry than the Palaeolithic age.

▪ **Neolithic (New Stone) Age:**

- Referred to as the **concluding phase of the Stone Age**, the age heralded the beginning of food production.
- Sedentism (living in one place for a long time) use of pottery, and invention of crafts are characteristics feature of neolithic age.
- The neolithic tools composed of heavy ground tools like pestles, grinders, pounders and also axes and sickles.

▪ **Megalithic culture:**

- Megaliths refer to **large stone structures** that were constructed either as burial sites or as commemorative sites.
- In India, **archaeologists trace the majority of the megaliths to the Iron Age** (1500 BC to 500 BC), though some sites precede the Iron Age, extending up to 2000 BC.
- **Megaliths are spread across the Indian subcontinent**. Majority of them are found in peninsular India, concentrated in the states of Maharashtra (mainly in Vidarbha), Karnataka, Tamil Nadu, Kerala, Andhra Pradesh and Telangana.

First Indigenous mRNA Vaccine Technology

Why in News?

[Council of Scientific & Industrial Research- Centre for Cellular & Molecular Biology \(CSIR-CCMB\)](#) has announced the success of '**proof of principle**' of the first indigenous Messenger RNA (mRNA) vaccine technology.

- This is different from the mRNA vaccine being developed by Genovax Bio based on self-replicating RNA.
- According to the researcher, the technology is ready to be transferred to any interested company to take it to the next step of performing human trials and bringing the vaccine to market with regulatory approval.

Proof of Principle

- Proof of Principle, also called Proof of concept, is a realization of a certain method or idea in order to demonstrate its feasibility, or a demonstration in principle with the aim of verifying that some concept or theory has practical potential.

What is mRNA Vaccine Technology?

- **About:**
 - mRNA vaccines use mRNA to teach our cells how to make a protein or a protein that triggers an immune response inside our bodies. That immune response, which produces antibodies, is what protects us from getting infected if the real virus enters our bodies.
 - The researchers developed indigenous potential mRNA vaccine candidate against [SARS-CoV-2](#).
 - It is based on the [Moderna model](#), but has been built with the information available in the open and indigenous technology and materials.
- **Efficacy:**
 - "Robust immune response" has been observed against the Covid-19 [spike protein](#) in mice upon administration of two doses of the mRNA.
 - The anti-spike antibodies generated were found to be more than 90% efficient in preventing the human ACE2 receptor binding to the coronavirus
 - Angiotensin converting enzyme 2 (ACE-2), known as ACEH (ACE homolog), is an integral membrane protein.
 - ACE-2 serves as the receptor for the SARS-CoV and SARS-CoV-2 viruses.
 - It provides the entry point for the coronavirus to hook into and infect a wide range of human cells.
- **Significance:**
 - The indigenous grown mRNA vaccine platform holds promise to deal with other infectious diseases such as [Tuberculosis](#), Dengue fever, Malaria, Chikungunya, Rare Genetic diseases and others.
 - The vaccines can be used for covering a pan-Covid-19 vaccine with different variants.
 - With that, vaccines can be developed for other diseases.

What are Different Types of vaccines?

- **Indigenously Developed Vaccines:**
 - [ZyCoV-D](#): Designed and developed by Zydus (a pharmaceutical company) with support

from the DBT.

- **Covaxin:** Developed by Bharat Biotech in collaboration with the ICMR.

▪ **Globally Developed Vaccines:**

- **Covishield:** Name given to an Oxford-AstraZeneca Covid-19 vaccine candidate which is technically referred to as AZD1222 or ChAdOx 1 nCoV-19.
- **Sputnik V:** The first vaccine to be officially registered and has been developed by Moscow's Gamaleya Institute in collaboration with Russia's defence ministry.

How are mRNA Vaccines Different From Traditional Vaccines?

- Vaccines work by training the body to recognise and respond to the proteins produced by disease-causing organisms, such as a virus or bacteria.
- Traditional vaccines are made up of small or inactivated doses of the whole disease-causing organism, or the proteins that it produces, which are introduced into the body to provoke the immune system into mounting a response.
- mRNA vaccines tricks the body into producing some of the viral proteins itself.
 - They work by using mRNA, or messenger RNA, which is the molecule that essentially puts DNA instructions into action. Inside a cell, mRNA is used as a template to build a protein.

What are the Advantages of Using mRNA Based Vaccines?

- mRNA vaccines are considered safe as mRNA is non-infectious, non-integrating in nature, and degraded by standard cellular mechanisms.
- They are highly efficacious because of their inherent capability of being translatable into the protein structure inside the cell cytoplasm.
- Additionally, mRNA vaccines are fully synthetic and do not require a host for growth, e.g., eggs or bacteria. Therefore, they can be quickly manufactured inexpensively to ensure their "availability" and "accessibility" for mass vaccination on a sustainable basis.

UPSC Civil Services Examination, Previous Year's Question (PYQs)

Q. Widespread resistance of malarial parasite to drugs like chloroquine has prompted attempts to develop a malarial vaccine to combat malaria. Why is it difficult to develop an effective malaria vaccine? (2010)

- (a) Malaria is caused by several species of Plasmodium
- (b) Man does not develop immunity to malaria during natural infection
- (c) Vaccines can be developed only against bacteria
- (d) Man is only an intermediate host and not the definitive host

Ans: (b)

Exp:

- Malaria is a life-threatening disease caused by Plasmodium parasites that are transmitted to people through infected female Anopheles mosquitoes.
- The malarial parasite has an extraordinary ability to evade the immune system, which explains the difficulty in developing an effective malaria vaccine.
- RTS,S/AS01 (RTS,S) is the first and, to date, the only vaccine to show partial protection against malaria in young children.
- **Hence, option (b) is correct.**

Q. With reference to recent developments regarding 'Recombinant Vector Vaccines', consider the following statements:

1. Genetic engineering is applied in the development of these vaccines.

2. Bacteria and viruses are used as vectors.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (c)

Exp:

- Recombinant vector vaccines are made through genetic engineering. The gene that creates the protein for a bacteria or virus is isolated and placed inside another cell's genes. When that cell reproduces, it produces vaccine proteins that mean the immune system will recognize the protein and protect the body against it. **Hence, statement 1 is correct.**
- Live recombinant bacteria or viral vectors effectively stimulate the immune system as in natural infections and have intrinsic adjuvant properties. They are used as the channel for the entry into the host organism.
- Several bacteria have been used as vectors, such as Mycobacterium bovis BCG, Listeria monocytogenes, Salmonella spp. and Shigella spp.
- Numerous viral vectors are available for vaccine development, such as vaccinia, modified vaccinia virus Ankara, adenovirus, adeno-associated virus, retrovirus/lentivirus, alphavirus, herpes virus, etc. **Hence, statement 2 is correct.**

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