

AGRICULTURE + ENVIRONMENT

Time Allowed: 3 hrs.

Max. Marks: 250

Q.	Marks	Instructions to Candidate
1.		<ul style="list-style-type: none"> • There are 20 questions. • All questions are compulsory. • The number of marks carried by a question is indicated against it. • Answers to questions no. 1 to 10 should be in 150 words, whereas answers to questions no. 11 to 20 should be in 250 words. • Keep the word limit indicated in the questions in mind. • Answers must be written within the space provided. • Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.
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80

Name SHIREEN PRAKASH

Roll No. _____

Mobile No. _____

Date _____

Signature Shireen Prakash

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GS SCORE
GS MAINS TEST SERIES 2020

Section - A

- Q1. It is not deficit monsoon, rather the lack of policies and mechanisms to drought-proof susceptible areas that turn the situation into a crisis. In light of the above statement, discuss the causes of droughts in drought-prone Bundelkhand region and suggest a few ways forward. (10 Marks)

Remarks

Remarks

Q2. If we have to double the income of our farmers, we need to focus equally on animal rearing apart from traditional crop farming. Examine the steps taken by government in this regard in the last five years. (10 Marks)

Livestock rearing contributes about 28% of agricultural GDP. India has one of the largest livestock population in the world according to 15th livestock census.

Problems in the agricultural sector
 → Declining real farm incomes adversely affecting rural consumption
 → Declining agricultural productivity and high presence of small and marginal farm holdings (86%) which are unviable.

In this context, livestock rearing has the potential to facilitate the doubling of farm income since it

- enables livelihood diversification
- augments rural income
- upliftment of female farmers
- commercial production - backward and forward linkages having potential for rural industry
- nutritional security.

Steps taken by the government in the 5 years

1. National Livestock Mission which focuses on improving livestock productivity, provision of important inputs like feed, veterinary services,

Focus on importance of animal rearing

Sound intro

◦ National Mission on Bovine Productivity of which Rashtriya Gokul Mission is an important component. Rashtriya Gokul Mission focuses on improving the productivity of indigenous breeds, availability of quality bovine germplasm, high quality bulls for genetic services, etc.

◦ National Animal Disease Control Program - aiming at eradication of diseases like Foot and Mouth Disease, Pestis ~~of~~ Ruminants, etc.

◦ Schemes on improving pig rearing in North East, etc.

◦ e-Pashu Haat portal for dissemination of farmer information on availability of quality germplasm

◦ Rashtriya Kamadhenu Aayog

◦ Budget 2020-21 → 70% coverage of artificial insemination services
→ eradication of livestock diseases

◦ Inclusion of Animal Husbandry under Kisan Credit Card Scheme and Animal Husbandry Fund under NABARD

Animal Rearing thus has the potential to augment farm income and improve agricultural productivity

3½

Need to explain objectives of each scheme briefly for clarity.

Q3. "Anthropogenic activities have been constantly threatening biodiversity of India's hotspots". Analyze the impact of human interference on the flora and fauna of these biodiversity rich regions. Suggest some of the conservation strategy with existing framework citing Gadgil and Kasturirangan Reports on Western Ghat. (10 Marks)

India is one of the mega diverse countries of the world with 4 biodiversity hotspots - Western Ghats, Eastern Himalayas, Sundaland (part), ~~North East India (part of hotspot)~~?

^{Satisfactory intro}
Several anthropogenic stresses like unsustainable industrial and urban development, agricultural practices like monoculture, deforestation have adversely affected biodiversity and ecosystems in these regions.

→ endemic species like Nilgiri Tahr, elephants, tigers etc facing anthropogenic pressures due to land use changes (increasing instances of human wildlife conflict)

→ heavy floods causing devastation (Kerala 2011, 19) - landslides, etc and also introduction of invasive species threaten the biodiversity of the region.

Conservation strategy for safeguarding biodiversity
Gadgil and Kasturirangan committees have recommended several measures for conservation:

→ Demarcation of ecosecutive zones: The

of change as well.

Remarks

Yadgi committee recommended that the entire western ghats, ^(more than 75% of total area) be considered an eco sensitive zone.

The Kashurbar committee recommended lesser degree of protection

• Restriction on development of large scale hydro power projects, mining etc where no new projects will be taken up and extensive environmental and social impact assessment studies to be carried out for old projects. Small scale projects should be encouraged

• Development in line with the ecology and rainfall patterns. In the western ghats, rainfall intensity increases with elevation hence extensive codes for excavation, construction, etc to prevent landslides. (Protect the old forests - habitat of flora and endemic fauna)

• Reduce deforestation and introduce sustainable agricultural practices

• Involvement of the local communities and local bodies in environmental conservation.

• Wildlife conservation

These recommendations have not been agreed to by the states. Multi stakeholder involvement and effective environmental governance are needed to ensure conservation

Better
conclude
with
conservation
of
biodiversity
hotspots

4

Remarks

* There requires more clarity in your handwriting throughout.

Q4. National Policy on Biofuels primarily tries to address supply-side issues that has discouraged the production of biofuels within the country. In this regard, highlight the salient features of the policy and also mention the benefits of the policy.

(10 Marks)

Biofuels are fuels derived from biodegradable and non fossil^{fuel} based sources like sugarcane (ethanol), agricultural waste, algal biomass, etc. They have significantly lower greenhouse gas emissions (GHGs) than fossil fuels and are less polluting. Good intro.

Supply side issues in India vis a vis Biofuels

- Non availability of adequate raw material
- Fragmented supply chain
- Lack of policy support, technology updation and capital availability.

The National Policy on Biofuels was formulated in 2018 to augment biofuel production and supply in the country.

Features of the policy

- Enlarged the scope of raw materials for biofuel agricultural surplus, damaged agricultural crops (broken rice), etc can be used and the modalities regarding supply, pricing, usage of such products to be decided by the National Biofuel coordination Committee
- Distinguished between basic and advanced biofuels wherein advanced biofuels are more

Discuss types of bio-fuels

that are produced from non food sources as (algal biomass) as opposed to basic bio fuels (lignocellulosic plant parts, vegetable oils) etc.

Sound analysis

- Higher level of support to advanced biofuels.
- viability gap funding to set up 2nd ethanol biofuel plants; other incentives and concessions (Pradhan Mantri Ki Van Yojana).
- Encourage the cultivation of plants which can be used to produce biofuels - ^{high energy} wheat grasses, etc.
- Encourage extensive R&D in biofuel production.

4

Benefits

- Higher production of biofuels will lessen our import dependence on fuels (around 80%),
- reduce emy thereby facilitating achievement of National Determined Contributions (40% of installed power from non fossil based sources)
- reduce air pollution (can reduce ^{global} warming)
- augment farm income

→ Add on:

- Employment generation
- Health benefits
- Cleaner environment etc.

Remarks

Q5. Discuss the major features of Tropical Rainforest Biomes. How are human activities impacting these biomes? (10 Marks)

Tropical Rainforest Biomes are called the lungs of the Earth and are found straddling the equator in South America (Amazon), Africa (Congo Basin, etc), Asia (South East Asia - Indonesia, Malaysia, Philippines, etc). They have been adversely affected by various anthropogenic activities.

Major features of Tropical Rainforest Biomes

- o heavy, dense vegetation - canopy of trees with no well defined season for shedding of leaves hence evergreen
- o ~~no~~ extensive stratification with little undergrowth (sunlight does not reach the ground)
- o poor quality of soil due to intense leaching under high temperature and heavy rainfall
- o low diurnal ^{daily} and annual temperature ranges (high temperatures with high humidity) - rainfall (convectional) almost daily
- o Mostly inhabited by tribes - shernbergy, shifting cultivation are the main occupations

In recent years, tropical rainforest biomes have come under increasing anthropogenic pressure

Sound intro

Good analysis of features

Remarks

due to → deforestation for commercial exploitation
 → mining
 → changing land use - agricultural expansion, monoculture, etc
 → loss of endemic species from the forests

The recent forest fires in Brazil have been the outcome of unsustainable human activities.

Hence, human activities have led to adverse impact on forest ecosystem and biodiversity of flora and fauna, and changes in micro climate

Conservation of these biomes is necessary for combating climate change and reducing greenhouse gas emissions.

3 1/2

Need to explain various environmental impact as well as social impact

Q6. Critics argue that organic farming is inefficient and requires more land than conventional agriculture to yield the same amount of food. Do you agree? Critically analyze the potential of organic farming in solving hunger problem and its economic viability for farmers. (10 Marks)

Organic farming encourages use of organic inputs like farm manure, for agricultural production as opposed to heavy reliance on chemical fertilizers and pesticides in conventional farming.

(integrated pest management)
Satisfactory intro

• Benefits of organic farming

- Sustainable agricultural practices - soil and water conservation
- efficient use of farm waste, cow dung for manure
- produce free from chemicals.

It has been argued that organic farming is less efficient than conventional agriculture.

→ Initially, the yield from organic farming may be lower than conventional farming.

However, with time, various studies have indicated that yield rises and may surpass conventional farming field.

Potential in solving hunger problems

◦ India's rank is 103 out of 119 countries in global hunger index (serious ^{hunger} ^{intensity}) with huge prevalence of malnutrition, standing (38.4% NFHS-5) etc

Role of organic farming

→ By improving productivity of soil and productivity

Remarks

Not required to be discussed here.
Better discuss how it can solve hunger problem.

soil health (organic manure) and reducing the adverse effect of chemical inputs, organic farming can improve ^{production} ~~productivity~~ especially in small and marginal farms

→ Augment farm and thus rural income and improve local production which can then improve the supply chain via a public distribution system. ICDS, etc

However, lower shelf life of produce along with inadequate storage may be a concern

Augment farm income by lowering dependence on chemical inputs and thus reducing cost of production

- Soil conservation - improve productivity
- Monetisation of farm produce - Fork to farm model - high demand of organic produce in the markets.

However, problems remain w/o a no availability of quality organic inputs like compost, inadequate extension services, marketing and storage, etc

Explain here economic viability

Discuss specific schemes

also

35

Q7. Why is the fishing industry well-developed on the western coast of India as compared to the eastern coast? Discuss the recent steps taken by the Indian government for the growth of this sector. Also, discuss why commercial fishing is less developed in southern hemisphere? (10 Marks)

Fishing contributes about 5.6% to agricultural GDP. India is the second largest producer of fisheries in the world with 64% coming from inland fishing and 36% from marine sources.

Fishing industry well developed on the western coast as compared to the eastern coast due to:

- western coast - submerged coast and estuarine formations - good catch potential
- Arabian sea - more saline waters for marine fishing.
- availability of backwaters in Kerala - inland fishing
- More developed states on the west coast - Maharashtra, Karnataka, Kerala hence fishermen have relatively good quality of fishing equipment
- East coast - less developed states and also the dispute with Sri Lanka is a major encroachment in territorial waters
- More ports on the west coast - greater opportunities for trade (West Asia, etc)

Steps taken by the government

o National Policy on fisheries to augment productivity of fisheries particularly from marine sector, availability of fishing vessels and equipment etc

Also mention India's geographical endowments

↓ Better discuss east-coast issue separately for clarity

Remarks

and sustainable fishing.

o Blue Revolution and mission Fish fisheries to augment production, deep sea fishing, sea cage need farming, etc, and also renewable fisheries sector for doubling farm income. Improving availability of fish seed, and feed along with mechanised vessels for improving catch

o Budget 2020-21 has several measures to improve fish farming

o Inclusion of fisheries in Kisan Credit Scheme, dedicated funds for improving infrastructure, and separate fisheries department

o Draft Policy on Mariculture

on: Fishery & Aquaculture Infrastructure Development Fund
The fisheries sector has the potential for improving the income of small farmers and at the same time, improving exports.

Sound analysis

Add on:

4

Q8. What are eco bridges? Discuss the need and significance of eco bridges in biodiversity management. (10 Marks)

Eco Bridges ~~are~~ include wildlife corridors which are meant to facilitate movement of wildlife ~~from areas~~ across disconnected or fragmented habitats. These are generally used by endangered animals like elephants, tigers, etc. Good intro

Need and significance of eco Bridges

- o Enable conservation of endemic and endangered species: Habitat fragmentation and resultant isolation can increase vulnerability by reducing genetic diversity and restricting the gene pool.

Thus, eco bridges can widen the gene pool improving survival Good analysis

- o Improve and increase prey availability as well as availability of water for animals
- o Reduce need for translocation of animals
- o Eco Bridges can also improve the green cover of areas which have witnessed deforestation due to land use changes
- o Reduce human wildlife conflict

Remarks

3 However, anthropogenic pressure has led to deterioration of these eco bridges which has adversely impacted these ~~some~~ territorial animals like elephants and tiger.

Conservation strategies must focus on the development of eco bridges for holistic conservation.

- Need to discuss significance of Eco-bridges as well.
- Need to discuss more challenges with respect to eco-bridges

Q9. Do you think that rise in the Minimum Support Price (MSP) would solve the problem of agriculture distress? Critically discuss. (10 Marks)

Minimum support price (MSP) is

announced by the Cabinet Committee on Economic Affairs at the start of the sowing season for 23 crops. It ensures that farmers are not adversely affected in case of overproduction and depressed prices.

The government in Budget 2019-20 announced that MSP will be 1.5 times the cost of production and a scheme - Pradhan Mantri Aardata Aay Sanrakshan Abhiyan (PM-AASRA) for procurement of pulses and seeds.

Benefits of rise in MSP

- Farmers income security in case of glut in market
- encourage investment in agriculture and thus improve production
- building buffer stocks for food security

However, a rise in MSP alone can't solve the problem of agricultural distress.

- Procurement is skewed in favour of two crops - wheat and rice and also limited to surplus regions (Punjab, Haryana, Western UP)

Need to explain MSP too

Bring out more benefits of MSP.

Remarks

Hence, farmers in the other regions and paddy crops like millets are not benefitted.

Sound analysis

o Lack of sufficient procurement centres - According to NIZ survey, only 49% of farmers are satisfied with the MSP scheme. Also, most small and marginal farmers sell off their produce to the local aggregator which defeats the purpose of a high MSP for them.

o Adverse impact on environment - due to excessive groundwater exploitation (rice cultivation in Punjab), etc.

o MSP does not cover the costs of production across India due to variation in farm costs and it is also argued that non adoption of C2 approach which covers imputed land costs reduces MSP calculation.

MSP can be temporary or stop gap arrangement. The real solution for assuring farm income is the development of robust agricultural marketing system.

→ Need to discuss certain suggestions which can address agricultural stress.

Remarks

Q10. Agriculture is not only sensitive to climate change, but also one of the major drivers of climate change. Critically evaluate. (10 Marks)

According to India's National Communication (Biennial Update Report to UNFCCC), agriculture is the second largest contributor of greenhouse gas emissions in India.

According to Economic Survey 2016-17, climate change can reduce farm income in irrigated areas by 25% and unirrigated areas by 25%.

Climate change, primarily, erratic rainfall patterns will lead to fluctuating yields for kharif crops, endangering livelihood security.

Changes in the Himalayan Ecosystem can disrupt agricultural production and livelihoods of more than 6 billion people in countries like India, Nepal, Bangladesh, etc.

Rising sea levels can lead to ingress of saline water into coastal areas, and submergence of agricultural lands in low lying areas.

However, agriculture is also one of the major drivers of climate change.

Unsustainable agricultural practices, — excessive use of fertilisers, pesticides without application of organic manure leads to deterioration in soil health. As a result, soil organic carbon is lost from

Need to discuss component of agriculture too

Sound analysis

Remarks

the soil (increasing emissions)

◦ Excessive application of nitrogen containing fertilisers (urea) leads to emission of nitrous oxide, a greenhouse gas

◦ Deforestation for agricultural cultivation mainly monoculture also increases greenhouse gas emissions.

◦ Cultivation of water intensive crops leads to depletion of water sources intensifying drought in the region

Concerted efforts must be

made to encourage climate resilient agriculture with active involvement of farmers, extension and research agencies, states and the central government

→ Need to discuss climate-based sustainability too.

Also add
 Role of
 productivity
 of GHGs

4

Add more
 points

Q12. Considering India's agro-climatic zones and the extent of smaller farms, analyze how far agricultural diversification can help in achieving food security, improving human nutrition and increasing rural employment. (15 Marks)

Agriculture contributes about 16% to India's GDP however more than 50% of India's population is dependent on agriculture for their livelihood. Rural incomes are critically dependent on the success of this sector.

Need to discuss agro-climatic zone.

Need and relevance of agricultural diversification

- o Augmenting farm income by enabling farm productivity and increasing employment opportunities for agricultural labourers and small and marginal farmers

- o Around 86% of farmers are small and marginal (10th Agricultural Census) across 15 agro climatic zones.

Diversified farm activities like livestock rearing, fish farming (ponds), beekeeping, etc can augment the income during seasonal unemployment in rural areas.

- o Livelihood and agricultural diversification can also strengthen backward and forward linkages thereby strengthening rural industrialisation and thus. Industries like

Elaborate this point

Good analysis of agricultural diversification.

Remarks

food processing sector, etc can provide a fillip to agricultural processing, improve rural infrastructure and thus increase rural employment.
stemming distress migration

(employment
Rural
Non farm
Sector)

Food Security and improving human nutrition

- Livestock rearing, fish pond farming, bee keeping etc can increase farm household incomes improving consumption and increasing food security.
- Improved agricultural productivity can lead to higher production improving food security.
- Enhanced production of nutritious crops - millets, dairy sector production can also enhance uptake of nutrition. ~~kernel~~ Agricultural diversification can also encourage food fortification, and can strengthen the supply chain for augmented local availability for public distribution.
- Combat hidden hunger and malnutrition (biofortified crops - farms)

Good analysis

However, there are certain constraints

- Inadequate implementation of programmes for agricultural diversification
- Lack of robust extension services and declining public sector investment

◦ Non availability of backward and forward infrastructure - warehousing, processing facilities etc

Convergence of schemes along with robust implementation of several schemes like Pradhan Mantri Kisan Vikas Yojana, Kushtanna Yojana, Hindonah Mission, etc is necessary for demersification

Good

6

Remarks

Section - B

Q11. "Deforestation of tropical rainforests for different reasons has caused serious concern for the global community as they are called 'Lungs of the World'. Discuss in context with deforestation of Amazon rainforest and rainforests of South-East Asia.

(15 Marks)

Tropical Rainforests are found straddling the equator in both hemispheres. In South East Asia (Indonesia, Malaysia, Borneo, etc), Africa (Congo Basin), South America (Brazil etc - Amazon Basin)

Several studies have indicated rapid deforestation of the tropical rainforests due to human activities especially particularly in Amazon and South East Asia.

Causes of Deforestation

- o Rapid and unsustainable industrial development mining activities in the Amazon forests; timber industry in South East Asia has led to massive deforestation here in these areas
- o Palm oil cultivation in the South East Asia particularly in countries like Indonesia, Malaysia has led to clearing of forests for monoculture. This has adverse impact on biodiversity and soil quality since palm oil is an exhaustive crop.
- o Rapid uncontrolled urbanisation in South East Asia along with spread of transport infrastructure

Remarks

Better discuss causes of deforestation in Amazon & South-east tropical rainforests separately

has led to deforestation. Excessive demand for wood has also led to exploitation of these forests -

- Climate change and the resultant rising temperatures have increased incidences of El Niño causing drought like conditions in South East Asia increasing the incidence of forest fires.

Impact of the deforestation of the lungs of the world

- Rising greenhouse gas emissions due to loss of carbon sequestered in these forests then increasing incidence of climate change.

- Higher amount of CO_2 in the atmosphere can disrupt ocean atmospheric circulation, and lead to change in rainfall patterns across the globe (more frequent occurrences of El Niño)

- Ocean acidification threatening marine biodiversity and sea level rise threatening coastal areas

- Tropical rainforests are the biodiversity hotspots of the world containing high number of endemic species. Deforestation has led to loss of habitat for endangered flora and fauna as also forest fires.

Rather than focusing on impacts better discuss benefits of rainforests

Loss of precious forest resources and endangering the lives and livelihoods of indigenous tribal communities

Lack of political will has also been one of the major causes of deforestation

4 Concurred efforts by the global community through international funding and global platforms like REDD+ is the need of the hour

Q13. Environment Pollution Prevention and Control Authority (EPCA) recently recommended to the Supreme Court that Delhi's buses switch to H-CNG within the next two or three year. In this regard, what do you understand by Bio-CNG and HCNG? What are the advantages of using H-CNG Vehicles? Also highlight the challenges. (15 Marks)

Delhi Air Quality Index Readings are mostly in the red or severely polluted zone. Source apportionment studies indicate that vehicular pollution and congestion is a significant factor.

Supreme Court mandated body EPCA has recommended a switch to hydrogen CNG or HCNG.

Hydrogen CNG is the addition^(blending) of hydrogen gas upto 10% - 15% in compressed Natural gas CNG (methane).

Bio CNG — 95% compressed natural gas (CNG) produced from biological or bio-degradable sources like biomethane, etc. The Ministry of Petroleum and Natural Gas, under SATAT scheme, aims to encourage the production and use of Bio CNG. Bio CNG is produced by the anaerobic decomposition of

Better explain CNG & H-CNG

Focus on advantages & disadvantages of using H-CNG.

Remarks

biodegradable waste.

Advantages of HCNG

○ significantly less non-polluting since hydrogen fuel on burning produces only water hence HCNG will produce lower particulate emissions and ^{low CO emissions} (10%)

○ higher efficiency of fuel combustion lowering usage (5% fuel savings) and gives greater mileage. ^{lower greenhouse gas emissions}

○ HCNG ^{fuel} is compatible with current engines and infrastructure hence will be easier to adapt to.

○ HCNG can also enable storage of energy in fuel cells.

○ Hybrid vehicles can use HCNG.

However, there are certain challenges:

→ Fuel stability vis a vis combustion and chances of explosion have to be looked into

→ Hydrogen production is capital expensive and the mode of production will determine whether HCNG is environmentally friendly or not.

→ Commercial infrastructure may require international investment

Remarks

→ HCNG storage & supply infrastructure is not easily available.

Sound analysis of advantages & disadvantages

Extensive R&D in HONG is important to ensure adaptability in the Indian scenario.

→ Development of less expensive quality tests is needed.

4

Remarks

Q14. The Environment (Protection) Act was enacted in 1986 with the objective of providing for the protection and improvement of the environment. To what extent has the act lived up to its mandate? (15 Marks)

The Environment Protection Act (1986) empowers the government to issue directions for environmental protection, introduce regulations and standards for emission of pollutants from industries and even order closure of violating industrial units. *Sound intro*

The Environment Protection Act 1986 created the central and state Pollution Control Boards (CPCB and SPCB) in this regard.

Using the powers under the Act, ^{regulate} and discharge of pollutants
o emission norms have been notified

to ensure reduction of industrial pollution.
~~location of industry~~

o eco sensitive zones and areas have been

identified around national parks and sanctuaries for comprehensive ecosystem ^{protection}

o groundwater management ^{and use} regulations through constitution of central groundwater authority.

o Environmental Impact Assessment

Need to be aware of salient features of EPA precisely.

Remarks

◦ Ambient air pollution quality norms for reducing air pollution and safeguarding human health

However, there have been several lacunae in the implementation of the Act

◦ CPCBs and SPCBs remain ineffective bodies due to shortages in manpower and funds. As a result enforcement of the Act remains poor.

◦ Lack of robust enforcement of emission norms has led to non-attainment of ambient air quality standards. The crant industries as a result are not penalised.

◦ Lacunae in carrying out environmental impact assessment (EIA) due to delay in grant of terms of reference, poor quality of reports, etc

◦ Groundwater pollution exploration has not been tackled effectively by central ground water Authority

◦ Lack of convergence is a poor implementation of other acts like Air Pollution Act, 1987, etc

Discuss more number of salient features with respect to conferring powers on the central govt; penal provision etc.

o Adoption of technology, source apportionment studies ^{of pollution} have not been carried out on a regular basis which hinders regulation and enforcement.

Thus, in order to bring about effective environmental governance, creating a robust framework for implementation of the act is necessary.

→ Environmental health should be made integral to the national economic growth agenda.

Q15. What do you understand by geo-engineering? Examine why North Eastern Monsoon brings less rainfall far below its actual potential and also critically discuss how geo-engineering can solve the problem. (15 Marks)

Geoengineering refers to the use of engineering techniques to alter or change the composition of the environment or atmosphere for desirable outcomes like more rainfall, reducing global warming.

Sound intro

North East Monsoon in India originates under the influence of the North East Trade winds in the cold weather season and is responsible for bringing rainfall to Tamil Nadu, Kerala, Karnataka.

North East Monsoon brings rains far below its potential —

- o presence of high pressure zones over the subcontinent

- o lack of adequate moisture and presence of humidity condensation nuclei for cloud formation.

Role of geo engineering in augmenting North East Monsoon

Remarks

Before this, need to discuss geo-engineering techniques too

→ Role of relative humidity is to be discussed too.

o Geoengineering techniques like cloud seeding can increase condensation nuclei in the atmosphere enhancing cloud formation thus bringing more rainfall.

o The temperature of the upper atmosphere can be reduced by spraying sulphur particles into the atmosphere which will enhance condensation of water vapour.

o An enhanced North East Monsoon can ease the problem of water availability and augment agricultural production.

However, ^{efficacy of} geoengineering techniques to yet to be tested on a large scale.

a) these techniques may not lead to increase in rainfall over the targeted area (travelling clouds)

b) the particles or substances used may be harmful for atmosphere in the long run, damage agricultural crops, etc.

Remarks

Discuss the role of geo-engineering techniques like albedo enhancement, space reflectors etc.

3/2

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Remarks

Q16. What is e-waste? A United Nations-affiliated group estimates that e-waste is growing faster than almost any other waste type. Examine how India can effectively manage its e-waste. Also, briefly discuss the fresh rules that India recently brought in to govern the handling of electronic waste. (15 Marks)

Satisfactory intro
e-waste refers to discarded, ^{defunct and} obsolete or damaged electronic equipment, improper disposal of which is hazardous to health and environment. Rising per capita incomes, technological advancement has meant that e-waste is rising day by day.

According to the Ministry of Environment and IT, around 2 million tonnes of electronic waste is generated in India annually. Only 5% of e-waste is recycled, hence e-waste has the potential to be the largest waste type in India.

ways for effective management of e-waste

good
• Increasing levels of recycling and also adopting technology for increased recovery of precious metals.

• Encouraging the entry of the formal sector - At present, more than 95% of e-waste is recycled ^{handled} by the informal sector which leads to poor recovery and also is hazardous to health.

Remarks

of the workers and environment hence, incentives should be given for opening new recycling units, etc.

o Opening e-waste parks and facilities like Trashmap (Chennai), etc.

o Adoption of manufacturing processes and which reduce end of life waste and also improving the supply of chain for take back system (system) of e-waste by producers.

o ~~Reduce, Reuse, Recycle~~

Add on more innovative approach like: - Behavioural change, Integration of different techniques

India has formulated e-waste Management Rules, 2011 for effective e-waste management.

Salient features are

o Introduction of extended producer responsibility (EPR) ~~and~~ wherein the producer will be responsible for collection of the e-waste under the take back system.

o Nationwide ^{one time} registration of e-waste recycling units

o Introduction of CFL bulbs and mercury containing equipments ~~and~~ under the ambit of

e-rules

Local bodies to be responsible for ensuring the enforcement of these rules.

6

Reduce, Reuse, Recycle, Recover, Redesign, Remanufacture - 6 step cycle should be adopted for effective e-waste management

→ Need to discuss challenges with respect to E-waste Management Rules, 2016 too

Remarks

- Q17. "Oceans and seas, are facing many challenges such as acidification, marine pollution, and overexploitation of fish stock, which is causing degradation of aquatic habitat". Critically analyse the role of commitments such as Charlevoix Blueprint for Healthy Oceans, Seas and Resilient Coastal Communities. (15 Marks)

Remarks

Remarks

Remarks

Q18. Agricultural diversification is an important mechanism for economic growth and doubling farmers income. It depends, however, on there being opportunities for diversification and on farmers' responsiveness to those opportunities. Analyse the challenges perceived and bring in key recommendations to help alleviate the problem. (15 Marks)

Satisfactory intro
Agricultural diversification involves carrying out various activities like livestock rearing, beekeeping, farm forestry, etc. in order to augment agricultural productivity and doubling farm income.

Schemes like National Mission on Sustainable Agriculture (NMSA), etc. envisage agricultural diversification for augmenting farm income. Hence there are various schemes like Rashtriya Yojna Mission, Blue Revolution, etc. for supporting diversified activities.

Challenges

→ Majority of farm holdings are small and marginal (86%) which are unviable. Hence majority of farmers subsistence farming which leaves little surplus for investment by farmers in other activities.

Discusses various opportunities of diversification like export potential, changing consumer demands etc.

Remarks

→ lack of robust rural infrastructure in terms of backward and forward linkages which prevents value addition

→ Inefficiency in agricultural extension services and agricultural education,

→ Information asymmetry and lack of awareness among farmers.

→ Inadequate private and public investment in agriculture along with deficiency in agricultural and allied activities especially for agricultural labourers and small and marginal farmers

Recommendations

○ Improving private investment in agriculture through incentives e.g. tax concessions, etc

○ Improving extension services and improving lab to land transmission of technologies.

○ Improving agricultural infrastructure and rural

○ Usage of Information, Technology (IoT),

Add on
more
challenges
- Urban
ization
- external
threats
etc.

Internet of Things (IoT), artificial intelligence (AI), etc to increase productivity in

livestock rearing, fisheries, beekeeping, etc.

Better explain each of the above recommendations briefly for clarity.

Q19. What do you understand by precision farming? It is said that future revolution in agriculture is going to come from precision farming and micro-irrigation can be the stepping stone towards achieving the goal of making Indian farming sustainable, profitable and productive. Discuss. (15 Marks)

Precision Farming refers to scientific application and ~~exact~~ and appropriate usage of farm inputs to improve agricultural production and productivity. ^{It encourages using information technology to access real time data for optimum productivity}

In India, lack of adequate extension services and farming ^{under machine} using traditional practices (non scientific) has meant that agricultural productivity has been stagnating.

Good intro

Precision farming → efficient management of resources through location specific high technology interventions-

• information based farm management for optimum profitability, sustainability and resource utilisation - using technologies like geographic information system (GIS), Global Positioning System (GPS), Remote Sensing, etc.

Sound analysis
Micro Irrigation - refers to the new application of water to the root of the crop (subsurface or surface)

Remarks

drop by drop which ensures optimum utilization of water, effective use of pesticides and fertilisers and ensures efficiency in water use and irrigation.

Hence microirrigation can improve sustainability of agriculture, reduce groundwater exploitation and reduce soil salinity.

Benefits of Precision Farming

- enhance agricultural productivity and prevent soil degradation in cultivable land
- reduce excessive use of chemicals
- ^{water use} efficiency, reduce groundwater contamination and nutrient leaching
- mapping of yield and soil characteristics
- Better resource management and reduce resource wastage

However, there are certain issues

- small unworkable landholdings
- lack of effective extension and R+D in agriculture

Try to make each of these self explanatory

slow levels of technology adoption due to
poor economic condition of farmers.

National Mission on Sustainable Agriculture
Pradhan Mantri Krishi Sanchayee
Yojana encourage precision farming and
micro irrigation for water use efficiency and
improving agricultural productivity

→ Need to discuss govt. initiative
in recent budget in regard
with given aspect

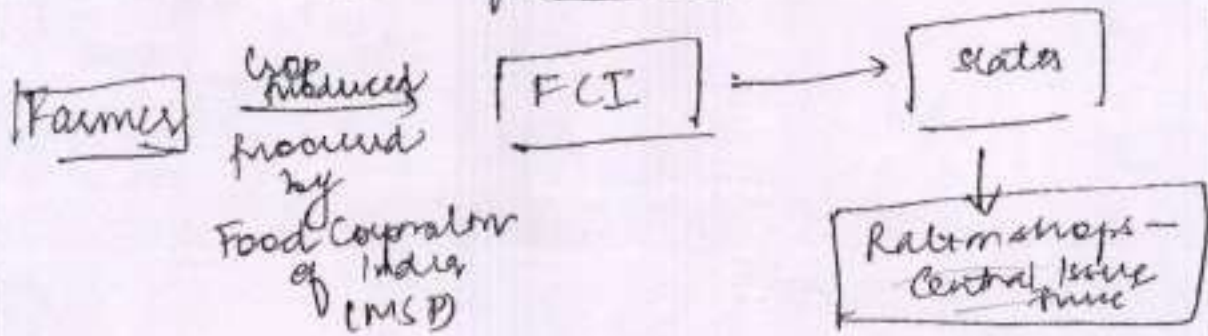
6

Q20. Food subsidy has increased six-fold over the past 10 years. In light of this, discuss the challenges in the effective implementation of Targeted Public Distribution System (TPDS) and alternatives to reform the existing machinery. (15 Marks)

Better explain food security & TPDS

Food subsidy forms the highest portion of overall subsidies of the government. Wasteful expenditure due to problems in the TPDS not only leads to increased revenue deficit but also prevents benefits from reaching the poor.

Chain of public distribution



Targeted Public Distribution System (TPDS) was introduced in 1997 due to problems ~~like~~ which have not been effectively resolved till then

These are

- > Inclusion Exclusion Errors (lack of effective targeting)
- > leakages and pilferage - sale to the open market by corrupt ration shop owners
- > lack of scientific procurement by Food Corporation of India - FCI is currently

Remarks

holding 8.5 times the stipulated requirement of food grains, lack of timely liquidation results in shortages and also leads to spoilage and wastage.

> Lack of sufficient point of sale machines (Pos) at the ration shops which also prevents beneficiaries from timely access.

> Migration - According to Census 2011, more than 45 crore are migrants. Lack of portability results in some family members, especially women being deprived.

> Nutritional Security - TPDS is not able to tackle hidden hunger and malnutrition effectively due to lack of dietary diversity.

→ There is issue with transportation too.

Reforms

o FCI reforms as recommended by the Shankar Jaiswal Committee. We decentralised procurement, storage in silos instead of godowns, etc.

o Food Security Act, 2013 covers around 67% of the total population.

o Effective beneficiary identification through JAM trinity and availability of adequate point of sale machines (Pos) at all ration shops.

Good analysis of issues.

• Best practices of states like Chhattisgarh (food coupons, card based tracking of food grain delivery, etc.) should be adopted by states

• Nation wide Ration Card Portability which will reduce corruption by reducing dependence on single ration shops, and pan India application enabling food security for migrants.

Use of technology along with scientific food grain management, ^{where} accountability is necessary to improve the machinery

Add on alternatives

- Computerized fair price shop
- Use of GPS technology
- SMS-based monitoring etc.