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Bioenergy Crops

According to a new study, converting annual crops to perennial bioenergy crops can induce a cooling effect on the areas where they are cultivated.

- Bioenergy crops include specific plants that are grown and maintained at lower costs for biofuel production.
- Biofuel generation using fast growing and photosynthetically efficient bioenergy crops is emerging as a reliable alternative to fossil fuels.
- Bioenergy crops are one such energy source that could positively impact the environment to reduce the level of carbon dioxide, emission of greenhouse gases and soil erosion.
- These crops increase soil carbon and fix atmospheric carbon. They could be used for the phyto-remediation of heavy metal-contaminated soils.
- Bioenergy crops are classified into five types namely,
    1. First-generation bioenergy crops - Corn, sorghum, rapeseed and sugarcane
    2. Second-generation bioenergy crops - Switchgrass, miscanthus, alfalfa, reed canary grass, Napier grass and other plants.
    3. Third-generation bioenergy crops - Boreal plants, crassulacean acid metabolism (CAM) plants, eucalyptus and microalgae.
    4. Bioenergy halophytes - Genera *Acacia, Eucalyptus, Casuarina, Melaleuca, Prosopis, Rhizophora* and *Tamarix*.
    5. Dedicated energy crops - Perennial herbaceous and woody plant species as giant miscanthus, switchgrass, jatropha and algae.
- Cultivation area under bioenergy crops occupies 3.8% ± 0.5% of the global total land area.
- But they exert strong regional biophysical effects, leading to a global net change in air temperature of −0.08 ~ +0.05 degrees Celsius.
- Biophysical cooling or warming effects of these crops can strengthen or weaken the effectiveness of bioenergy crop cultivation with carbon capture and storage (BECCS) in limiting the temperature increments.
- This depends on the cultivation map and the bioenergy crop type.
- Compared to the herbaceous crops, changes in the energy fluxes induced by woody crops in the cultivation regions are larger, and the cooling effect is stronger and healthier across different cultivation maps.

Reference

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Carbon Capture and Storage

- Carbon capture and storage (CCS) or carbon capture and sequestration is the process of capturing carbon dioxide before it enters the atmosphere, transporting it, and storing it (carbon sequestration).
- By capturing the emitted carbon dioxide, the gas doesn't rise up in the atmosphere and cause (further) global warming.
- **Working** - There are three steps to the CCS process:
    1. **Capture** - CO_2 is separated from other gases produced in industries like coal and natural-gas-fired power generation plants or steel or cement factories.
    2. **Transport** - CO_2 is compressed and transported via pipelines, road transport or ships to a site for storage.
    3. **Storage** - CO_2 is injected into rock formations deep underground for permanent storage - in pores of sedimentary rock formations, or in dead oilfields (that once held oil or gas), or in underground coal seams.
- **Ways** - There are essentially two ways of approaching CCS.
    1. Technology-based solutions and
    2. Nature-based solutions.
- **Technology solutions** use machinery to capture fumes and remove carbon dioxide from them.
- The most basic way to dispose them is to bury the gas underground.
- The captured carbon dioxide could also be injected into living oil and gas wells so as to push out the hydrocarbons.
- Scientists have also suggested that the carbon dioxide could also be injected into gas hydrates (frozen gas-water mixture), whereupon the carbon dioxide will push out the gas in the hydrate and take its place.
- **Nature-based solutions** do not 'capture' carbon dioxide but offset the emissions by sucking up the gas from the atmosphere.
- These solutions essentially involve growing trees. Mangroves are said to have an enormous potential to suck up carbon dioxide.
- **Efficiency** - If done on the scale required, the CCS would definitely help reduce global warming.
- In 2019, the world emitted 36.7 billion tons of carbon dioxide. Today, CCS projects are negligible in comparison with the emissions.
- **Cons** - CCS is costly. Typically, if you want to do CCS in a thermal power project, the process would take away between 6 and 10% of the power generation for itself. Then, there are capital and maintenance costs.
- **India's plan** - The Indian government's plans are more in the realm of ‘nature-based solutions’.
- It is very difficult to see technology CCS coming up in India, unless financially supported by the developed countries.

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2. https://www.nationalgrid.com/stories/energy-explained/what-is-ccs-how-does-it-work

RBI Approved Offline Small-value e-Payments

The Reserve Bank of India (RBI) has come out with the framework for facilitating small-value digital payments in offline mode.

- To promote digital payments in semi-urban and rural areas, this framework allows offline payments upto **Rs. 200 per transaction**, subject to an overall limit of Rs 2,000.
- This framework was launched under the Payment and Settlement Systems Act, 2007.
- An offline digital payment doesn't require Internet or telecom connectivity.
- Under the new framework, offline payments can be carried out face-to-face (proximity mode) using any channel/ instrument like cards, wallets and mobile devices.
- Such transactions wouldn't require an Additional Factor of Authentication.
- Since the transactions are offline, alerts (by way of SMS and / or e-mail) will be received by the customer after a time lag.
- The RBI said the framework took effect 'immediately'.
- It also said that authorised Payment System Operators (PSOs) and Payment System Participants (PSPs) looking to facilitate small value offline digital payments have to comply with the new guidelines.

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Pangong Lake

China is constructing a bridge in Ladakh connecting the north and south banks of Pangong Tso (lake), which will significantly bring down the time for the Chinese Army to move troops and equipment between the two sectors.

- Pangong Tso, which means 'high grassland lake', is an endorheic lake spanning eastern Ladakh and West Tibet.
- This boomerang-shaped lake is situated at a height of more than 14,000 ft in the Ladakh, Himalayas.
- This landlocked lake is the world's highest saltwater lake.
- More than two-thirds is under Chinese control, while the remaining one-third of the Lake lies in India.
- Khurnak Fort, close to where China is building the new bridge, is near the halfway mark of the lake. It is also under the Chinese control.

Endorheic Lake

- An endorheic lake (or a sink lake or terminal lake) is a collection of water within an endorheic basin, or sink, with **no evident outlet**.
- The largest endorheic lake is the **Caspian Sea**. It also happens to be the largest overall lake in the world.

- The two main ways that endorheic lakes accumulate water are through river flow into the lake (discharge) and precipitation falling into the lake.
- The collected water of the lake, instead of discharging, can only be lost due to either evapotranspiration or percolation.
- Endorheic lakes are generally **saline** as a result of being unable to get rid of solutes left in the lake by evaporation.
- These lakes can be used as indicators of anthropogenic change, such as irrigation or climate change, in the areas surrounding them.
- Lakes with subsurface drainage are considered cryptorheic.

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Chalk Streams

- 'Chalk Streams' are pure, clear, constant water streams from the underground **chalk aquifers and springs**, flowing across flinty gravel beds. This makes them perfect sources of clean water.
- These streams occur only where chalk bedrock meets the Earth's surface, making them globally rare. The world has fewer than 300 chalk streams, and England has most of them.
- Their stable, cool, nutrient-rich waters allow chalk streams to support an exceptionally high number of species - so much so that these habitats are sometimes described as "England's rainforests".
- **Shared Habitat** - In their headwaters, these streams can naturally disappear during the summer, leaving their channels dry.
- Their waters reappear in winter and so the streams are known locally as winterbournes.
- As these streams naturally shift between wet and dry conditions, they allow aquatic and terrestrial species to share one habitat at different times.
- Beneath the chalk stream itself, in the underlying aquifers, blind, colourless crustaceans live, contributing to the ecosystem's biodiversity.
- Filtered by the chalk, the groundwater springs forth in clear, nutrient-rich streams which support photosynthetic plants and microorganisms - the fuel for food webs that feed everything.
- **Threats** - Wide range of human activities, pollution, etc
- Many chalk aquifers - the source of chalk streams - are sadly polluted by nitrogen and phosphorus from fertilisers spread on farmland.
- As they flow downstream, water running off urban and rural areas adds other pollutants, including fine sediments and pesticides.
- Sewage also affects the quality of water in many chalk streams.
- The natural courses of many chalk streams have been straightened and rerouted to make space for agricultural, urban and industrial land uses.
- Many are dwindling to a trickle as water companies take water from both streams and the aquifers beneath them.

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