# Solar Energy in Agriculture

This editorial is based on **"Solar energy: For Amrit Kaal in agriculture"** which was published in The Indian Express on 22/08/2022. It talks about boundless potential of Solar Energy in India's Agriculture Sector.

**For Prelims:** International Solar Alliance (ISA), Solar Crop Drying, Solar Pumping System, One Sun One World One Grid (OSOWOG), Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM).

**For Mains**: Off Grid and On Grid Solar Energy, Potential of Solar Energy in Agriculture, Government Schemes to Enhance Solar Energy Production in India.

**Renewable energy** has started playing an increasingly important role for augmentation of **grid power**, providing energy access, reducing consumption of **fossil fuels** and helping India pursue its **low carbon** development path.

India has set a target to increase the country's share of **non-fossil-based installed electric capacity to 40% by 2030.**

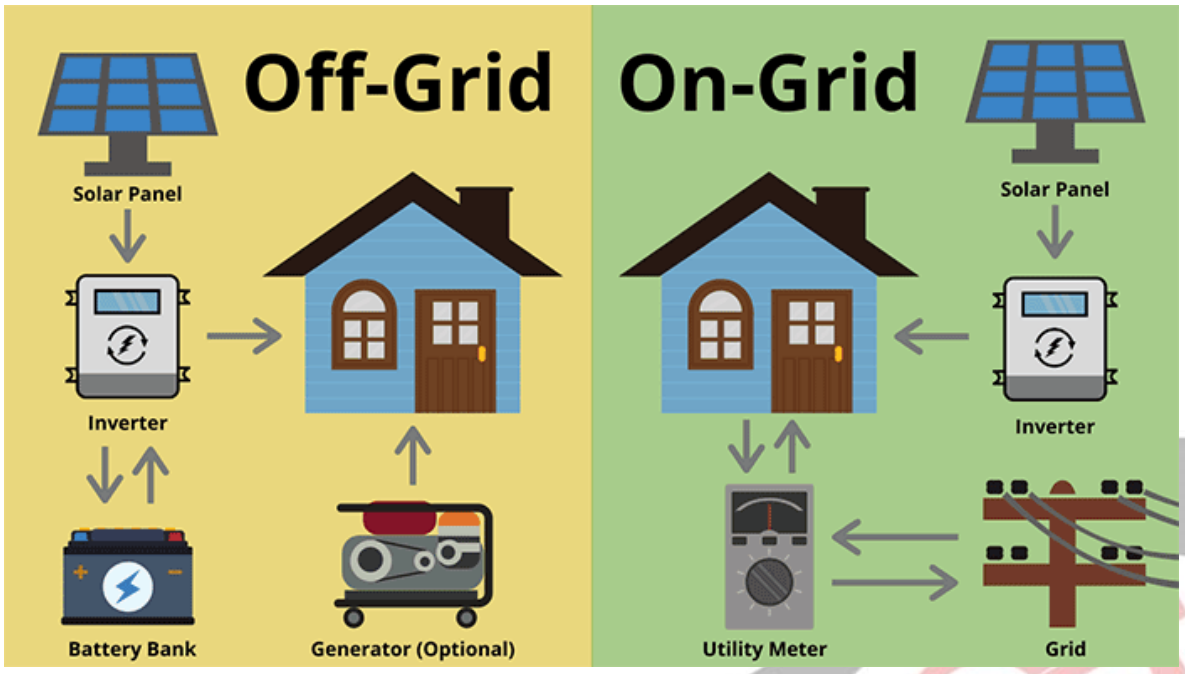
India has been playing a leadership role in encouraging the establishment of a **solar based economy** across the globe. India, in partnership with France, promoted the establishment of the International Solar Alliance (ISA) **in 2015**. In **2018**, ISA was transformed into a **treaty-based organisation headquartered in India.**

**Solar power** is one of the most versatile forms of energy, with **boundless potential, if tapped wisely.** Solar Energy can be a game changer for the **Agricultural Sector in India**, saving precious water resources, reducing dependency on the **grid,** and even becoming an additional revenue stream for farmers.

## What is Off Grid and On Grid Solar Energy?

- **On-grid** means the **solar system that is tied to the local utility's grid or utility company.**
  - **Utility system acts as the battery space for Solar Energy Users.** It means that the surplus energy that is produced by the solar panels is sent to the grid's power company, and in exchange a credit is generated that one can cash out at the end of the year.
    - Being grid-tied is **beneficial because there is no requirement of an expensive battery back-up system** to store any excess energy.
- **Off-grid means** there is **no connection to the grid's power system** or utility company.
  - This is appealing because of **100% self-sustaining energy** use.
    - However, there are disadvantages because off-grid systems require a **back-up battery which can be expensive, bulky, and not very environmentally**

**friendly which defeats the purpose of going solar (save money and live greener).**




## What is the Potential of Solar Energy in Agriculture?

- Solar energy can easily fulfil energy provision and supply at agriculture farms. Various solar energy absorbing devices and systems have been developed and are in the works for agricultural applications. This includes:
    - **Solar Pumping System:** It is quite helpful to operate the already burdened irrigation system in India.
        - Specifically, solar pumps can be useful as **water lifting devices in irrigation canals** and also to **evenly distribute water in those areas where traditional water systems could not have access**, such as in the elevated hilly lands.
    - **Solar Crop Drying:** Different types of solar dryers are available for various applications, which can be used for drying of agricultural products like **potatoes, grains, carrots and mushrooms.**
    - **Solar Spraying:** The solar **pesticides** sprayer machine can improve their productivity for small farmers.
        - Most pesticide spraying activity is done in the daytime, so these **spray machines could be used by directly capturing solar energy**, which prevents the installation of batteries in these machines.
    - **Solar Powered Tractors:** Tractor **converted agriculture farming into** agro-industry by performing a lot of functions with the help of a variety of tools and equipment.
        - Usually, **tractors consume oil to run and work, which increases the budget of farming and also causes the** pollution in the atmosphere by producing **carbon dioxide** during combustion.
            - **Solar powered tractors became a good option which could work directly under the sun by consuming solar energy** in daytime and also could continue working in night time with the help of energy stored in batteries.

## What are the Challenges of Integrating Solar Energy with India's Agriculture Sector?

- **Land Scarcity:** Per capita land availability is very low in India. **Land is already a scarce resource in India**, with its demand ranging from **farmers, industries, commercial and service institutions and the Government.**

    - Dedication of land area near substations for exclusive installation of solar cells might have to compete with other necessities that require land.
- **Export Driven Market:** Manufacturers are mostly focused on export markets that buy Solar cells and **modules at higher prices** thereby increasing their profits.
    - Many new suppliers have tie-ups with foreign players in Europe and the United States, thereby **prioritising export demand.** This could result in reduced supplies for the fast-growing local market in India.
- **Grid Integration:** The biggest challenge for the solar sector is **grid integration to the length and breadth of the country** followed by poor financial condition of **Distribution Companies (DISCOMs).**
- **Absence of Solar Waste Management Policy: India does not have a solar waste management policy** to complement ambitious solar power installation targets.
    - **Solar waste is the electronic waste generated by discarded solar panels**. It can increase by at least **four-five-fold by the next decade.**
- **Commercial Viability and Utility:** The solar energy production technique is yet to be improvised in to make it commercially viable in India.
    - **Topographically or climatically** also, sun rays are uniformly not available at any particular place throughout the year.
    - Besides, people, especially farmers in general are yet to be educated and convinced about its uses and utilities.
        - Unlike **thermal power plants,** Solar Power is **consumer dominated** and therefore, **peoples' participation and acceptance are critical issues for its success.**

## What are the Related Government Schemes to Enhance Solar Energy Production in India?

- **International Solar Alliance**
- **National Solar Mission**
- **Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM)**
- **One Sun, One World, One Grid (OSOWOG)**

## What Should be the Way Forward?

- **Incentive-Based Expansion Policies:** Transforming from a **non-renewable energy-**based system to a **renewable-based agriculture** system imposes several challenges.
    - RE transition should be **immediate but orderly** and must be **backed with incentive-based policies** to expand the solar network in the country.
- **Solar Energy- Multi-potential Candidate for Development:** Solar energy is an attractive candidate to fulfil the electricity needs for domestic utility as well as to run **electric vehicles,** also fulfilling the **cooling and heating requirements** in future.
- **Better Financing and Training:** India demands better financing infrastructure, models and arrangements to spur the Solar industry at the village level.
    - It is crucial to train and develop human resources, as well as impart **skill development to rural youth,** so that villages can become self-sufficient in managing the solar devices.
- **Consumer Awareness:** There is a need to build consumer awareness about the technology, its economics and right usage.
    - **"Solar Mascot for Har Khet Main Saur Urja" can be introduced in rural areas** to spread awareness about the potentials of Solar Energy in agriculture and **energy management.**
- **Linking Solar Energy Targets with the Current Missions:** Missions like **'Make in India'**, **'Smart city mission' and 'Digital India'** can be integrated with the **off-grid systems** that can lead to **'Grid ready India'.**
    - If these initiatives are executed as envisaged, it is only a matter before India becomes one of the world leaders in **Solar Energy.**
- **Agriculture in Line with Solar Production:** There should be a combined **agricultural use of**

**land with the production of electric energy by solar energy.**

- It provides solutions for the production of food crops and, at the same time, electricity generation under consideration of soil protection and water savings.
    - This can **increase the sustainability of food, water, energy, and** climate **at the same time meeting the various** Sustainable Developement Goals **of the United Nations.**

***Drishti Mains Question***

"Solar Energy can be a game changer for the Agricultural Sector in India". Comment.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

**Q. Consider the following statements: (2016)**

1. The International Solar Alliance was launched at the United Nations Climate Change Conference in 2015.
2. The Alliance includes all the member countries of the United Nations.

**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: (a)**

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**Q. With reference to solar power production in India, consider the following statements: (2018)**

1. India is the third largest in the world in the manufacture of silicon wafers used in photovoltaic units.
2. The solar power tariffs are determined by the Solar Energy Corporation of India.

**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: (d)**