



Solar Energy Technology Future of Agriculture

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Agriculture technologies are changing rapidly on day-by-day basis. Farm machinery, building, production functionaries and productivity of crops are constantly being increased. The sun is enormous resource of solar energy. Agriculture practices needs as energy as important input factor of production. Thus, Solar energy can be used to generate electricity for lighting homes and operating machineries, directly for heating, water heating for diary operations, solar cooking, and also for industrial and commercial uses. Solar energy technology can increase farmer's income and improving the living conditions of peoples by reducing total input cost of production. Solar energy can be used in agriculture in a number of ways, saving money, increasing self-reliance, and reducing pollution, cut a farm's electricity bills, low maintenance cost, diverse application and technology development. The costs of solar energy are lower than other electrical or mechanical power sources as it is one time investment for the farmers. However, this is one of the clean, ecofriendly and reliable sources of energy.

Solar Energy

The sun is only source of solar energy on earth. The country's solar energy installed capacity was 70,000 MW in current time. In India Rajasthan leading the pack, Rajasthan contributes 17,839 MW, Gujarat contributes 10,133 MW, and Karnataka contributes 9,050 MW while Madhya Pradesh contributes only 3,021 MW and Uttar Pradesh contributes a mere 2,526 MW solar capacity. The Bhadla Solar Park is a solar power plant located in the Thar Desert of Rajasthan, India. It covers an area of 56 square kilometers and has a total installed capacity of 2,245 megawatts (MW), making it the largest solar park in the world as of 2023.

Solar technology can be mainly classified as –

Active solar technology: Active solar technology included the use of photovoltaic systems, concentrated solar power and solar water heating to utilize the energy. Active solar energy is directly consumed in such as drying clothes and warming of air.

Passive solar technology: Passive solar technology refers to the harnessing of the sun energy without the use of mechanical devices. Using south facing windows to provided natural lighting and heating for your house.

Types of Solar Energy Technology: There are the two main types of solar energy technology-

1. Photovoltaic solar energy (PV) directly converted sunlight into electricity, using a solar technology based on the photovoltaic effect, by which certain material are able to absorb light particles (photons) and release electrons that generating an electric current.

2. Concentrating Solar Thermal Power (CSP) system use mirrors to reflected & concentrates sunlight onto receivers that collected solar radiation & convert it to heat, which

can then be used to produce electricity & store for later use. Concentrating solar thermal power is used primarily in very large power plants.

Composition

The sunlight that reached the ground consists of nearly 50 % visible light, 45 % infrared radiation and minor amounts of ultraviolet light and other forms of electromagnetic radiation (EMR). This radiation can be converted either into the thermal and electrical energy. Mainly two types of devices are used to receive solar energy and convert it into thermal energy.

1. **Flat- plate collectors:** This device is used to hot water heating and house heating.
2. **Concentrating collectors:** Concentrating collectors are used when higher temperatures are need (Fresnel type solar energy). That is, where they reflect and concentrate sunlight from a wide area.

Solar energy can be converted to electricity using photovoltaic solar cell. This converted energy is used to provide electricity for cameras, water pumps lighting etc.

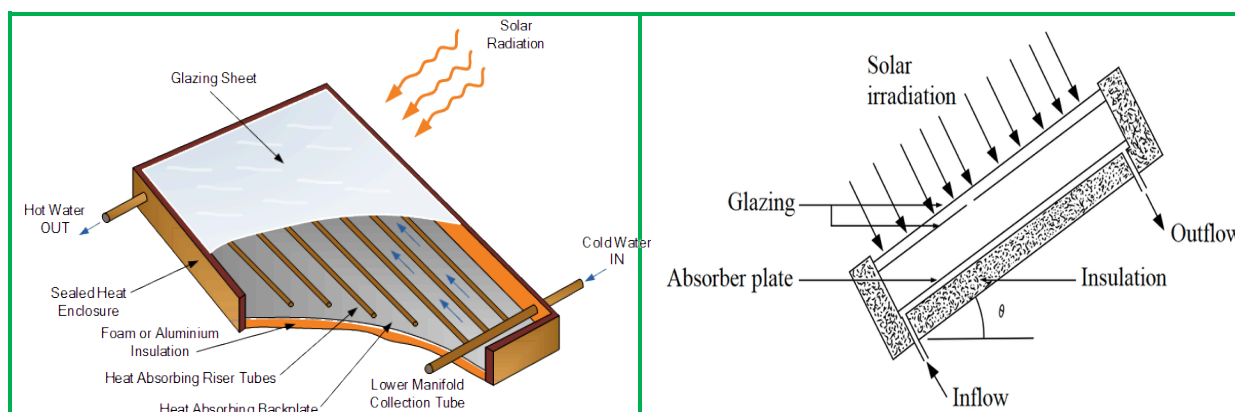


Fig: 1. The use of solar radiation by flat plate collectors

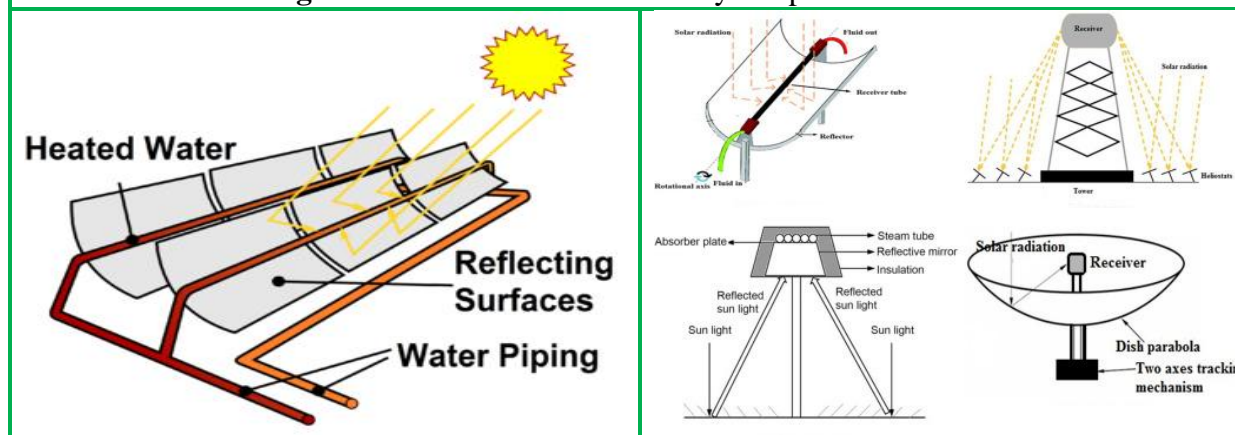


Fig: 2. The use of solar radiation by concentrating collectors

Solar panel subsidy cost

- Individual farmers will be supported to install standalone solar Agriculture pumps of capacity up to 7.5 HP in off-grid areas, where grid supply is not available.
- CFA of 30% of the benchmark cost or the tender cost, whichever is lower, of the standalone solar Agriculture pump will be provided. The State Government will give at-least a subsidy of 30%; and the remaining at-most 40% will be provided by the farmer. Bank finance can be availed by farmer, so that farmer has to initially pay only 10% of the cost and remaining up to 30% of the cost as loan.
- In North Eastern States, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand, Lakshadweep and A&N Islands, CFA of 50% of the benchmark cost or the tender cost,

whichever is lower, of the stand-alone solar pump will be provided. The State Government will give at-least subsidy of 30%; and the remaining at-most 20% will be provided by the farmer.

Uses of Solar Energy in Agriculture - Solar energy can be used in different ways in agriculture and household works: -

- **Crop and Grain Drying** - Using the sun dry crops and grains is one of the oldest and most widely used applications of solar energy technology in agriculture.
 - The different types of solar dryers- Natural open-air dryers, Direct & indirect solar dryers.
- **Sole water pumping** - Photovoltaic system must be the most cost effective and income generating option in locations where there is no existing power line.
- **Solar cooker & solar oven**- It is a device which uses the energy of sunlight to heat drink and foods to cook.
- **Solar water heating** - Solar water heating system can be used in livestock, dairy and other agriculture operations that have significant water heating requirement.
- **Greenhouse heating** - Agriculture application of solar energy is greenhouse heating. A solar green house has thermal mass to collect and store solar heat energy and insulation to retain this heat for using during the night and on clouding days.
- **Remote electricity supply through solar photovoltaic** - Light directly converts into electricity by this technology. PV material commonly utilizing highly purification silicon, converts solar radiation directly into electricity. It is applied in store solar energy in a battery.

Conclusion

Solar is a safe alternative for agricultural energy needs as it is-

- Solar is clean and safe in operation
- Importance to environment protection
- Prevents destruction of habitats and combats climate change
- Social and economic benefits for farmers
- Efficient electricity sources for rural areas
- Requires low maintenance
- Cheap and reliable energy sources as it needs one time investment

So, the conclusion is that the adoption of solar energy technology is beneficiary to the farmers as compare to switch on any of source of energy to fulfill farm and household need of energy.