

## SEEDS DRYER USING SOLAR SYSTEM

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### **Keywords:**

Arduino Uno, charge controller circuit, buck converter, fan, heating element, temperature sensor, relay module, heating chamber

### **Introduction:**

The process of drying the grains, vegetables is done to preserve agricultural product for long duration. The solar heat energy combined with air is being used to dry seeds for preservation and this traditional method involves time. Other traditional method of drying the grains is drying the grains and vegetables in sunlight during the day time only. This process involves a lot of manual work. Few other systems involve driers that can be used any part of day and these driers are operated by burning the fossil fuels to produce the hot air. But burning of fossil fuels leads to greenhouse gases. Hence our proposed work makes use of the renewable energy sources to overcome these problems. Drying system designed makes use of solar radiation which is ecofriendly to dry the grains. The dryer is useful in many applications where the temperatures required is below 700 C for drying and space heating etc. many solar dryers have been evolved over the ages, the main category of solar dryer is, natural solar dryer and forced convection solar dryer. In natural solar dryer, there is air flow developed by floating air flow but in a forced convection solar dryer [1], air flow is developed by using blower. Technical progress must be improved for reducing the time and the work load of the farmers. As agriculture sector is one of the most important as well as backbone of Indians economy, our main vision is to develop the productive and effective solar dryer which will be safe to operate and cost effective to. There are lots of application being used automatic grain dryer [2]. Using the automatic drying system can complete the drying process in a few days. By using the modern technologies maintain the constant temperature in the seeds containing chamber for drying seeds in the system.

### **Objectives of the project:**

The main objective of this paper is to make the work of farmers easy, faster and high efficient in grain drying, postharvest for storage. The designed mechanism takes less time to dry up grain using solar photovoltaic based drying as compared to traditional drying process. It also aims to reduce intensive labour experienced by the farmers. Primary objective is to develop a forced convection solar dryer in which the seeds, fruits, vegetables are dried simultaneously by the heated air from the solar collector. The secondary objectives are utilized renewable sources of energy with lesser power input, develop v-corrugated Aluminium plate or glass tubes for solar collector, develop an affordable and easy to use solar dryer so that it can be accessed in remote locations also.

## Methodology:

Software Requirement is Arduino IDE and hardware requirements are Arduino uno, solar panels, charge controller, relay module, temperature sensor, heating element, fan, buck converter and battery

Figure 1 shows the block diagram of the seeds dryer using solar system unit. Here the Arduino UNO is the heart of the system. In this system we use solar panel to supply the power supply to the system. During the day time it observes the light energy and converts into the electrical energy. The generated energy is given to the charge controller and the charge controller regulates the voltage and further supply flows to a battery. The charge

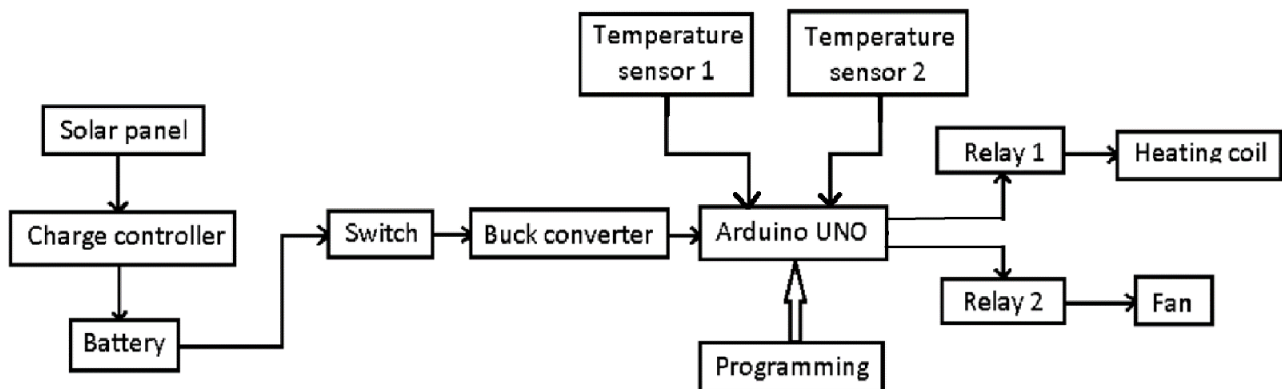


Figure 1. Block diagram of seeds dryer using solar system

controller monitors the battery voltage and reduces or disconnects the supply from the solar panel. The battery is connected to the switch for the purpose of controlling. Another end of the switch is connected to the Buck converter. Here the Arduino uses 5V DC supply and the battery voltage is 12V. To reduce the voltage from 12V to 5V we use Buck converter. Here we use two temperature sensors, one for monitoring the chamber heat and another for monitoring the atmospheric heat. The heating coil is used for heating the air by the convection method of heat transfer for drying the seeds. The fan is used for exhaust the hot air into the chamber [3]. The fan and heating elements are supplied voltage from battery supply and operation are controlled by Arduino, relay1 and relay2. The temperature sensor1 senses the present heat in heating chamber, for maintaining temperature in the heating chamber the range of temperature which is allowable to run only from exhaust fans are designed. When the temperature is out of the range detected by sensor fan goes off. An Arduino will operate the DC fan by using relay module.[4] The temperature sensor2 senses the temperature at the atmosphere and is connected near the air tubes. In night time temperature sensor 2 will help to turn on the heating coil through the relay 2. When heating coil turns on the air which passes through air tubes are made to pass above the heating coil and thus the generated hot air with the help of fan is made to flow in seed containing container. The moisture present in the grains drained out. These grains now can be stored for long duration of time.

Construction diagram:

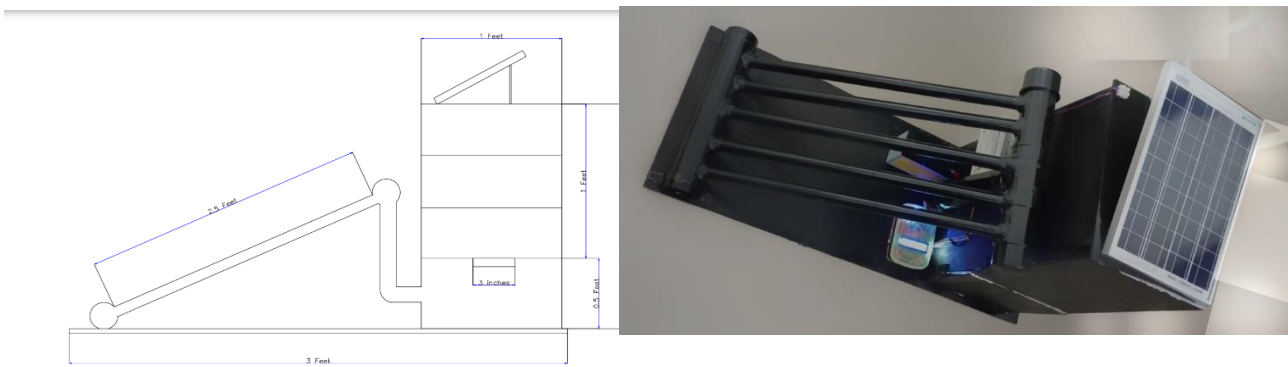


Figure 2. Constructional diagram of the solar seeds dryer system

The above figure 2 shows the constructional diagram of the seeds dryer using solar system [5]. This is the indirect type drying system [6]. It consists of two types of air pre heating systems. In the first method the temperature present in the atmosphere is used to heat the air in the air tubes. And in the second method suns light radiations are used to generate electricity by using of solar panels. This electrical energy is stored in the battery. This electrical energy further used for producing heat in the heating element. The hot air coming out of heating element flows throw the chamber containing grains by the help of exhaust fan. Finally, the air will be exhausted throw the top hole in the container [7]. This system uses heat collector tubes in sunny time for heating air and the heating elements are used in the night time and cloudy times [8].

### Result And Conclusion:

The developed drying system is able to dry the grains in certain temperature and also requires few days to dry the grains. This system dries the 1kg of peanuts in the 1 days after harvesting. Then it is possible to the peanuts will preserve for long duration, without any colour changing or decomposition of peanuts. After drying the peanuts, it will not contain any health hazarding products. It has the same taste has compared to the open solar drying peanuts

The proposed project exhibits how the grains dried easily after harvesting without any time delay. As compare to the previous dryer systems. This system saves the time of the farmers. For working control action and maintenances, it not requires any skilled persons. Its has the high efficiency. It is the reliable drying system, because of it dries the grains in day time and night time also. This system not requires any non-renewable sources. This system is very clean drying system, do not produce any smoke or dust. This system is most suited for small and medium scale farmers and remote area agricultural lands. The work of the farmer is eliminated as he does not have to spread the grains across huge landfills to dry them under the sun. The drying process can be completed within few days in this system.

**Future scope:**

- In future this system senses the moisture using moisture sensor and display it. If the seeds are contained certain amount of moisture, it gives alarm and display indication
- The flow of the input hot air will be controlled by varying the fan speed
- Online controls are possible using IOT (Internet of Things)
- Updates in solar heat collectors

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