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Review on Multi Grain Dryer

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Abstract:
Paddy is one of the largest consuming foods with the subsequent increase of food growing. Especially in rural areas, there is an accompanying need for preservation method. Though the steam driers are available and they all are having capacities of more than 20 tonnes. this much of quantity small scale farmers are didn't get. Then, they will go for natural drying by sun. they are fully depending on sun light, thiswill be getdifficulty to farmers in rainy season.While drying in fields or Road side, domestic animals disturb the spreaded Grains, this will be difficult task especially in rural area. During the rainy season nofarmer have a chance to spread the gains in the fields because of, the rain water will be stored in the field area. Also, not every former have a much space under sheds to store the grains till rain gets over. Also, sun drying have some disadvantages like slow drying process. In sun drying process for some time farmer have to turn or stir the grains. This paper is the comprehensive work done with the aim of reducing the cost of drying and also for practical demonstration of some of the theoretical knowledge acquired. It was discovered that the drier is efficient since the heat leakage was found to be very low.

Keywords: *Grains, Sunlight, Capacity of grains, Drying, Sheds.*

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I. Introduction:

Grain drying is process of drying grain to prevent spoilage during storage. Hundreds of millions of tonnes of wheat, corn, soybean, rice and other grains are dried in grain dryers. In the main agricultural countries, drying comprises the reduction of moisture from about 17-30% to values between 8 and 14%, depending on the grain. The final moisture content for drying must be adequate for storage. Drying is carried out as a requisite for safe storage, in order to inhibit microbial growth. However, low temperatures in storage are also highly recommended to avoid degradative reactions and, especially, the growth of insects and mites. A good maximum storage temperature is about 18 °C. Drying is that the process that reduces grain moisture content to level where it's safe for storage. Drying is that the most important operation after harvesting a rice crop. Delays in drying, incomplete drying or ineffective drying will reduce grain quality and end in losses.Rice is foremostfood crops in the entire world. West Bengal state has the best production of rice in India. The removal of moisture from the grain after post-harvest is getting complexity nowadays. This can be due to farmers are harvesting at the time of November/December, because of seasonal change at that time there are heavy rains. High moisture in grain also lowers the germination rate of rice. Therefore, drying of rice is critical to stop insect infestation and quality of rice grain and seed. The main advantages of grain drying are:

Safer storage – By reducing the moisture content in the grains, the possibility of degradation or germination of the cereal is eliminated: therefore, it can be stored even for long periods in a safe manner maintaining the quality of the product.More productivity and quality, More value and profits**,** Less waste.

Dryer:

The drying process is based on the diffusion of moisture from the inside of the grain to the outside. The hot and dry air that touches the grain leads to a heating of the humidity inside the grain which tends to evaporate to saturate the hot air.

Types of Driers:

There are various kind of dryer designed for drying grains grass, fruits and vegetables, Different types of dryers are constructed with fan to remove the moisture in vegetable for better storage. Some of the drying operations and types of dryers are listed below:

Field Drying and Sun Drying:

This is the system of drying where the combined effects of sun and wind provide the motive forces for effective evaporation. Effective successful 'field drying depends on local climate condition at point of harvest and therefore, is restricted to warm/hot parts of the world where wind and air humidity are satisfactory. Sun drying

of harvest material is variable and only possible where the climate is suitable. Fruit and seeds are more frequently dried than vegetable, but some fruits regarded as vegetables are dried successfully in this way.

Air Drying:

This may be batch wise or continuous and equipment include tunnels, trays or oven dryers, drum or roller dryers, pneumatic, trough rotary, cascade, tower, spiral, fluidized bed bin and but abend dryers, spray dryers, vacuum dryer etc, in most drying situations mechanical assistance is needed over and above the-force of nature, this being the convectional concept of air drying. For effective drying the partial pressure of water vapour is the air surrounding the material to be dried must be significantly lower than its saturated pressure at the operating temperature. This can be expressed as a relative humidity ratio and the lower the ratio the more effective the drying. As the ratio rises so fresh lower humidity air must be introduce into the system or the water vapour removed from it by some means. In generate hot air dryer are designed to allow a high airflow in the early stage but not so much as to move the material being dried, except where this is a requisite feature as for fluridised bed dryer. Typically an airflow rate of 180-300mm/min is used for vegetable piece, with dry' bulb air temperature of90°C to 100°C and wet bulb temperature 50°C.As moisture contents fall the airflow rate is reduced and drying temperature is decreased to 55°C or less until the moisture content is below 6,0%, Separate driers may be used to complete the final stage of drying, In fluoridised bed and air light or pneumatic driers, the airflow must be of sufficient velocity to lift the particles to be dries from a porous plate bed and cause them to behave as a liquid. This allows them to flow over a weir to exit the drier. Movement within the airstream provided excellent mixing and even drying. This can be used for powders; dried vegetables and for small whole vegetable such as peas. Again, the moisture content and temperature of the air can be varied as can the airflow to suit the material being dried.

Vacuum Drying:

These driers may be cabinet batch driers or continuous band driers with vacuum locks at infeed and outlet in either case heat transfer is by radiation and conduction. The advantage of vacuum drying is that evaporation of water takes place more readily at low pressures.

II. Literature Survey:

Conceptual development of Domestic Grain dryer during this paper Dr.I. A. Khan[1]describes the Conceptual working of domestic grain Dryers, also explains how system works with regard to the Temperature inside the cupboards.

Study of Design and Development of Turmeric processing unit: A Review during this paper Prof. Rajendra Pethkar describes the traditional method of Turmeric. the standard method for post-processing uses boilers and cookers which are designed with none engineering and mathematical background.

The conventional methods for post-processing uses boilers and cookers which are designed without any engineering and mathematical background. Due to which, the boilers and pressure vessels are very bulky and heat losses are more. After designing this system theheat losses are reduced, and the drying time is reduced to 3 to 4 days.

Design and fabrication of Experimental Dryers for studying Agricultural products. during this paper S. Rafiee[3] describes the results for paddy field drying presented here are useful in calculating the moisture transfer process occurring during high-temperature drying and ventilated storage. The dryer may be adopted for skinny layer modelling of varied Argo based products.

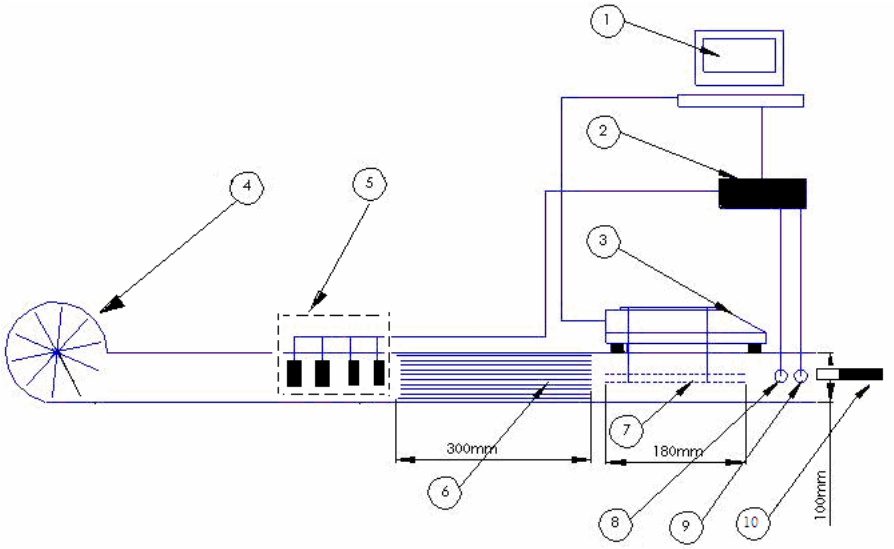

Fig 1. Schematic diagram of automated thin-layer drying system: 1. PC; 2. microcontroller; 3. digital balance; 4. fan; 5. heating elements; 6. duct and tunnel; 7. trays; and 8. temperature; 9. relative humidity, and 10. air flow velocity sensors[5].

Schematic diagram of total system developed for the experimental work is shown. In the showed diagram through the 6 and 7 the grains are getting drained.

Design, Development and Performance Evaluation of alittle Scale Solar Assisted Paddy Dyer for on farm Processing during this paper Sidrah Ashfaq[1] describes the easy and economic solar assisted paddy dryer Also showed that solar assisted paddy is more efficient compared to traditional open sun drying method the solar assisted paddy dryers can dry good quality paddy at low cost.

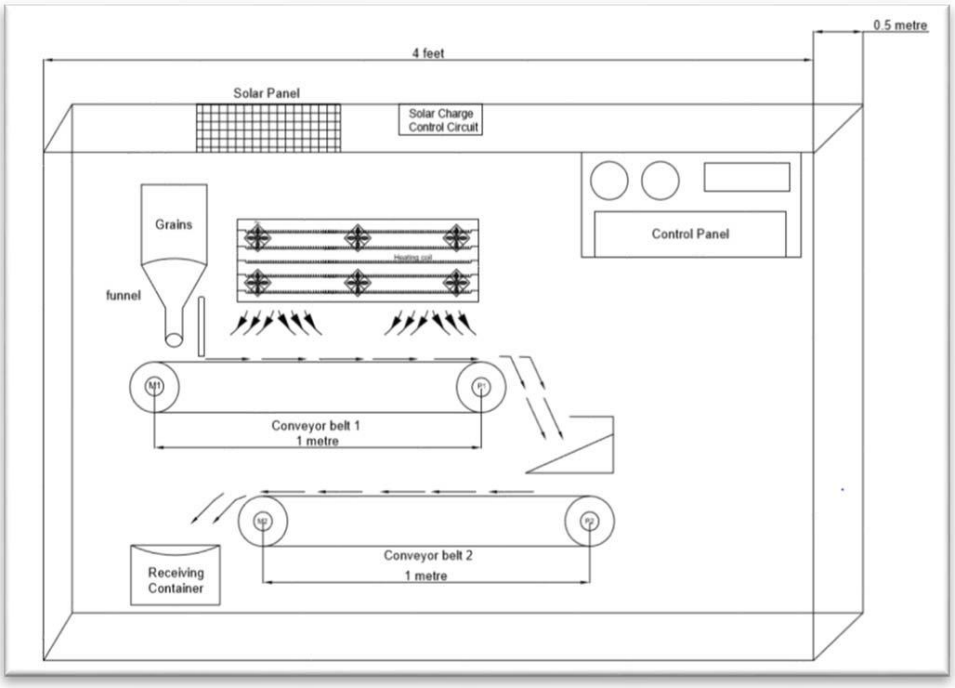

Fig 2: Design of the proposed system in AutoCAD[3].

In this design they showed the process of grain drying. At first the solar panel generates the electricity by using of sun light. Generated electricity is used to heating coils for heating of the coils to produce hot air. And the hot air is given to the grains which are traveling through the conveyor belt. The grains are getting drained before travelling to next conveyor belt. The grains are collecting in receiving container. After this the grains are ready to pack and store. In this design we can observe the control panel, which is used for controlling of temperature of heating coils.

Design and Development of solar Powered Automatic Grain Dryer for storage during this paper Kiran Kumar B M et al[5] describes how the grains after harvesting are often dried easily with none hassle and time delay It also shows how the technology advanced controlling action where each of the grain is measured and controlled to convey accurate and effective results.

Performance Testing and Evaluation of On-form mobile Paddy Dryer during this paper N. Sreedhar Redd et al[1] describes the mobile paddy dryer has the considerable. advantages over the open sun drying method in terms of faster drying rate and handling convince.

Design and Evaluation of solar Grain Dryer with a Back-Up heater during this Paper Duncan O-Mbuge et al[4] describes the Natural convection solar dryer assisted with an easy biomass burner as back-up heating the dryer system was ready to maintain consistent air temperature inside the dryer and reduced drying time significantly.

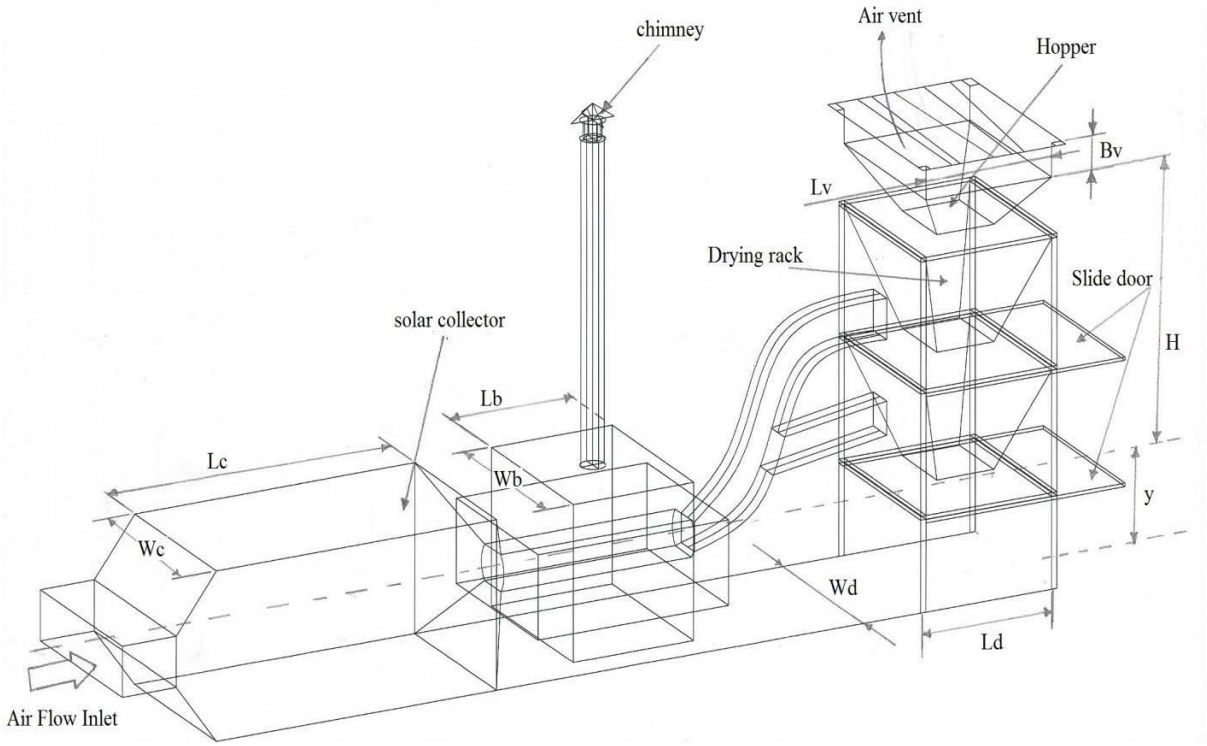

Fig 3: Schematic view of the solar dryer with back up heater.[16]

In this schematic diagram from the solar collector setup, the generated electricity is used for grain drying process. For this, the backup heater is added to give some more hot air to drying chamber. The backup heater is using biomass as the fuel to produce hot air. In backup heating chamber we need to use the chimney, to release the exhaust air.

Fig4: The rotating rice grain dryer prototype[9].

The Development of Rotating Rice Grain Dryer Prototype, AMARIN TONGKRATOKE Faculty of Science and Engineering, Kasetsart University, ChalermphrakiatSakon Nakhon Province Campus, Sakon Nakhon, Thailand. The household GPBR grain dryer prototype was developed to be suitable with the GPBR dehumidifying processes before the GPBR products could be sent to the buyer or be stored in their containers. There were three parts of the original prototype; the driving part, the drying chamber and the base and frame. The chamber was designed to hold 100 kilograms of rice grains and driven by the 1-hp-AC motor at 2.8 rpm (the chamber velocity) through the sprocket and chain system. The developed parts, which were installed on the prototype, consisted of 1) the tray for collecting the grains outside the chamber, 2) four wheels to make the prototype movable and to take the proper sunlight and 3) 5 fins attached inside the chamber to increase grain distributions during the drying process. The experimental results of the developed prototype showed that the developed prototype could dehumidify the GPBR grains from 21% wb down to 15% wb. Apparently, the fins helped the dehumidifying process shortened by 33.33%. The ambient relative humidity also affected the dehumidifying period, the higher relative humidity the longer drying period. The developed household dryer prototype was proved to be practical for the GPBR drying process. The dryer users were satisfied with the improved performance.

III. Conclusion:

From the literature survey it is concluded that,

A mobile grain dryer has to be designed to dry the paddy rice and other multi grains from an initial moisture content of 24% to a moisture content of 14%.

The work of the farmer is eliminated without spreading the grains across huge landfills to dry them under the sun. The drying process may be completed within lesstime during this system.The initial cost and also the running cost of the proposed system is extremely less as all the components used are very cost effective and are readily available.

Most of the grain dryers which are used for drying of huge tons of grains whereas mobile grain dryer is used for small quantities of grains and it is movable from one place to another easily.

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