Career Episode 1

Solar Seed Dryer Fabrication

A) Introduction

[CE 1.1] The work was done in the Agricultural Engineering field at the University of Tolima, Columbia.

Name of Project: Solar Seed Dryer Fabrication

Duration: [Date] – [Date]

Location: University of Tolima, Colombia

Position: Agricultural Engineering Student

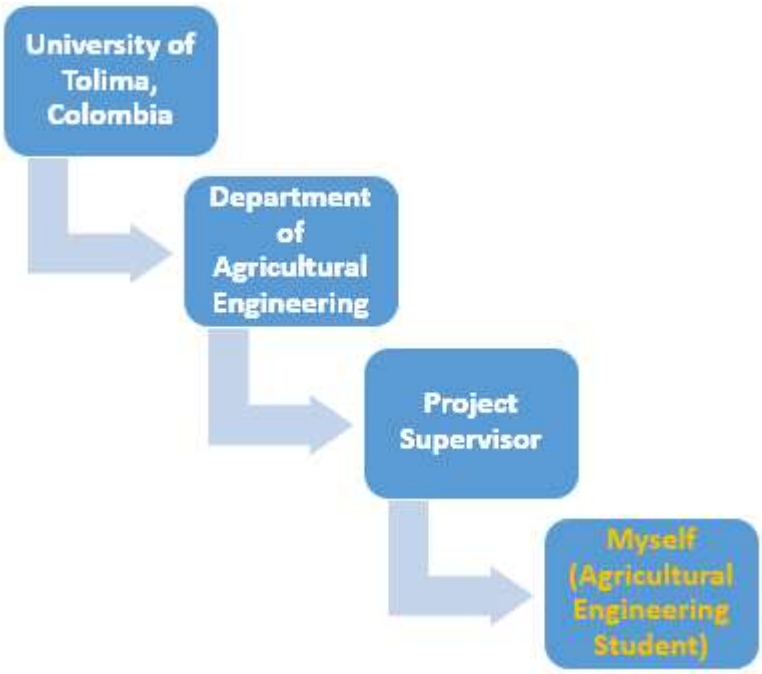
B) Background

[CE 1.2] The most useful technique for preserving the agricultural products is the sun drying in most of the tropical and subtropical regions. But, the consideration of the factors from the dust, wind-borne dirt and rain, insect's infestation, and other animal work on the serious degradation to the point that it became inedible with the resulted food quality loss in the dried products. This has an adverse effect on the national and international markets. There are various issues linked with the open-air sun drying and these can be sorted with the usage of the solar dryer which mainly consists of the drying chamber, collector and the chimney.

[CE 1.3] The project aim was the solar seed dryer fabrication which was done with the analysis made related to the tropical countries conditions for making the usage of the solar energy for drying food attractively. I worked on the development of the dryer which was utilized for drying the agricultural products and it was mainly for shell life improvement. During the conducted research, there was the utilization made on an energy source like electricity along with another energy form. I conducted the research regarding the fact related to the techniques lacking by the small farmers and it was due to the data collection and the final design. These were inappropriate for the farmers because of the cost factor which remained inaccessible and the technology sub transfer from the researcher to the final end-user. I noted that the drying was a helpful technique for preventing the fruit from the deterioration. I recommended the preservation of the fruits and fresh foods spoilage utilizing the dry methods and fruits such as mangoes mainly dried for the export purpose.

[CE 1.4] The activities related to the technical work were carried out well in the Agricultural Engineering field which provided significant assistance for obtaining the technical results within the defined time period of the project.

[CE 1.5]



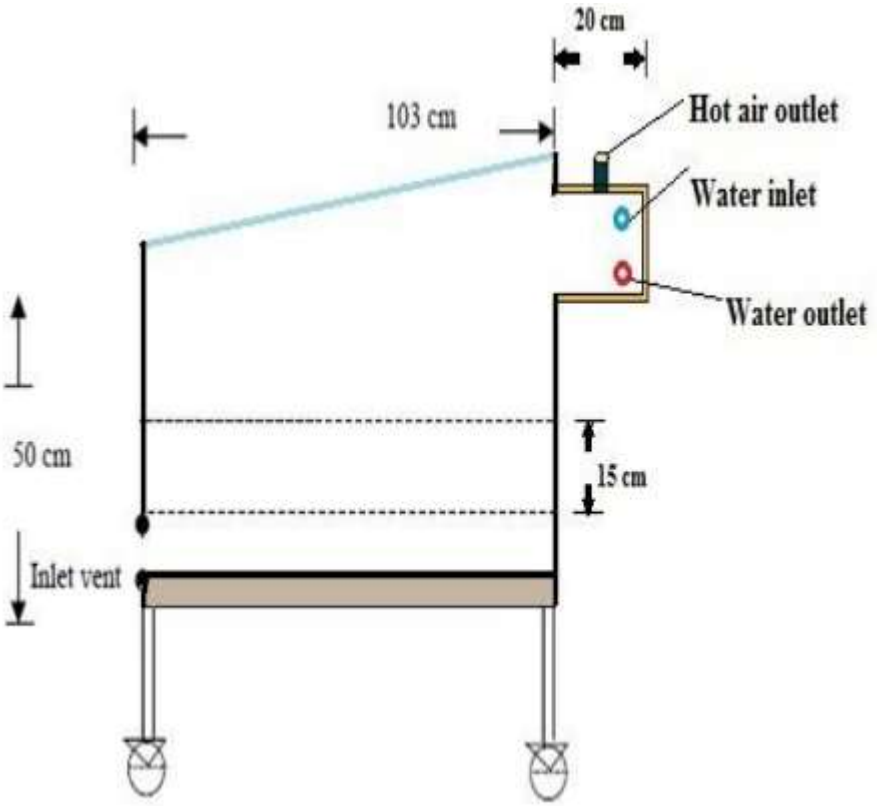
[CE 1.6] My work duties:

- I made the thermosiphon principle worked with the effect of greenhouse gas resulted in obtaining the main design consideration elements.
- I worked on the selection of the material for the construction of the effective solar dryer.
- I worked on keeping the design spacious for the defined dimensions with the obtained air passage.
- I did the potatoes weight measurement in the evening and morning followed by analyzing the results with the original weight of the potatoes.
- I obtained the inlet and outlet temperature values which were then set during the experimental analysis.
- I did the dryer construction which was mainly for the dry vegetables under the controlled and protected conditions.

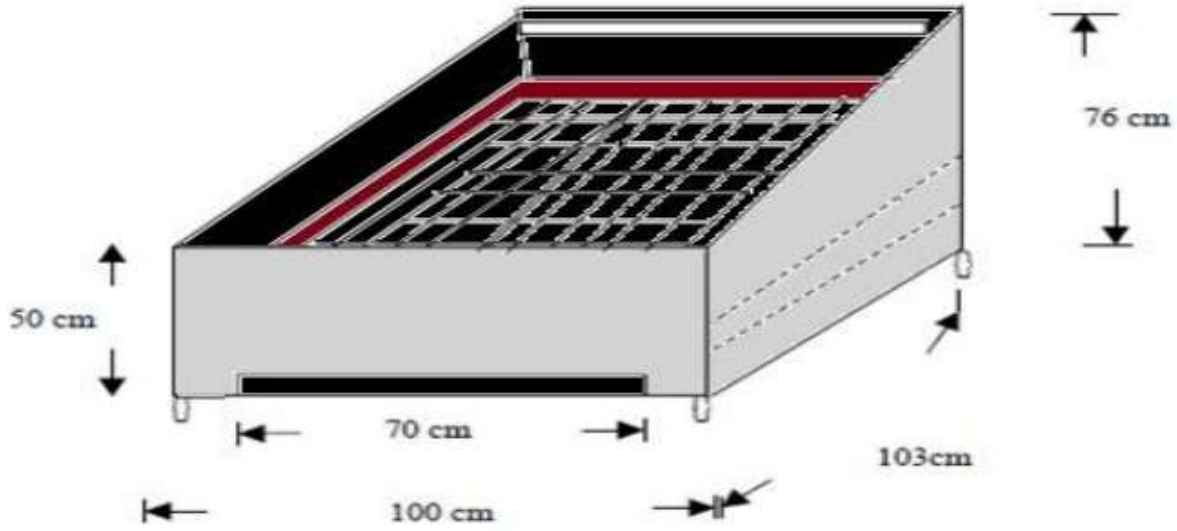
C) Personal Engineering Activity

[CE 1.7] I started the work with the research being made on the cabinet's most common design type and the types were utilized for improving the usage of the cardboard boxes along with the transparent nylon. I selected the thermosiphon principles with the greenhouse gas effect for the considered design. I noted the presence of the air vent with the guideways to the collector of the solar in which the air entered and was heated up using the greenhouse effect. There was an increase in the hot air through the drying chamber from the trays and it was around the food for the moisture content removal and exited the air vent across the shadowed side top. I used the hot air which acted as the main drying medium and it extracted and conveyed the product moisture to the atmosphere

under the convection free process. It resulted in showing the system as the passive solar system and there was no mechanical device needed for the controlling of the air intake into the dryer.



[CE 1.8] I selected the materials for the effective solar dryer construction and it included glass, wood, nails, and glues, handle and hinges and galvanized steel. It followed with the mesh wires, copper tubes, and wheels. The proposed design isometric view is shown underneath.



[CE 1.9] I adopted the design considerations which included the minimum temperature for the drying food and it was set at the 30 degrees temperature with the maximum temperature being set at the value of 60 degrees. I also considered the 45 degrees average temperature for drying fruits, vegetables, tuber crops, seed, roots, and other fruits. I implemented the design selected for the dryer optimum temperature. I set the inlet temperature at 60 degrees and the ambient temperature was set at the value of 30 degrees. I then obtained the air gap which was based on the hot climate passive solar dryers along with the 5cm gap and it worked as the air passage and air vent.

[CE 1.10] While setting the dimensions, I recommended that the same air exchange along with the roomy drying chamber was attained in the design of the solar food dryer. I made the design spacious for the specified dimensions with the air passage was set outside the cabinet. I roofed the drying chamber with the glass and it was for keeping the temperature within the drying chamber at the constant value because of the glass greenhouse gas effect. I set 1cm2 dimension for the dryer trays which was selected according to the screen of the dryer with the valid aid air circulation made within the drying chamber. I made two trays which were of wooden edges and the tray dimension was also defined initially with the wooden sticks which were utilized as the frame. I carried out the dry chamber design with the usage of the GS sheet wall sides along with the glass top for the food protection to be placed on the trays and these were directly from the direct sunlight as it was not desirable and removed other related flavors which prevented the fruits from drying.

[CE 1.11] During testing, I placed 2550 grams of potato for drying which was done in the open drying system along with the solar drying system. I then measured the potatoes weights in the evening and it was 2300 grams in open and 2100 grams in closed drying. I worked on the item placement for drying for the next day morning and it was noted that the open drying weight was 2000 grams and closed drying weight was 1800 grams. The open drying and controlled drying images are shown underneath.

D) Summary

[CE 1.12] I did the solar dryer designing and fabrication which was mainly done with the experimental research on the drying and these were under the controlled conditions. I constructed the dryer which was for dry vegetables under the protected and controlled conditions. I designed the dryer with the 1.2 collector area and it was expected to dry around 18kg of fresh vegetables from 76% to 10% wet bases in three days under the ambient conditions. It was done during the harvesting period from January to February. I executed the dryer prototype with the 1m2 area of the solar collector utilized in the experimental drying testing. I employed the water heating system for the dryer mainly to the waste heat recovery obtained from the dryer. Thus, the practical utilization of the dryer was highly enhanced with the implementation of the dryer with the water heating system.