DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF BATCH-TYPE LETTUCE (*Lactuca sativa* L.) SPIN-DRYER

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ACCEPTANCE SHEET

This undergraduate thesis entitled **"DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF BATCH-TYPE LETTUCE (*Lactuca sativa* L.) SPIN-DRYER,"** prepared and submitted by **JOHN DAVID SANTUA ESTEVES,** in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AGRICULTURAL MECHANIZATION AND RENEWABLE ENERGY),** is hereby accepted:

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BIOGRAPHICAL SKETCH

John David S. Esteves was born on the 26th day of May year 1998 in San Jose City, Nueva Ecija. He is the youngest son of Mr. Rodante R. Esteves and Mrs. Maricyl S. Esteves. He has two siblings named Dianne S. Esteves and Dexter S. Esteves.

He completed his primary education at St. Joseph School, school year 2009-2010. He finished his secondary education at Constancio Padilla National High School, school year 2013-2014. He pursued his tertiary education at Central Luzon State University at Science City of Muñoz, where he took up Bachelor of Science in Agricultural and Biosystems Engineering with area of specialization in Agricultural Mechanization and Renewable Energy.

During his stay at Central Luzon State University, he joined different organizations which help him to develop his skills and build his personality. He joined non-college based organization which is Society for the Advancement of Volunteerism and Excellence – Nueva Ecija (SAVE-NE) and college based organization which is Society of Agricultural Engineering Students – Philippine Society of Agricultural Engineers (SAGES-PSAE).

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ABSTRACT

ESTEVES, JOHN DAVID S., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines. **June 2019, DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF BATCH-TYPE LETTUCE (*Lactuca sativa* L.) SPIN-DRYER**

Adviser: MARLON T. DELOS SANTOS, M.Sc.

Lettuce is one of the commodities which is highly produced in our country because of its fresh and crispy. However, lack of facilities and post-harvest handling operations are being faced by the farmers. Lettuce need to be washed after harvesting to remove dirt and dust, maybe pesticides and to detach bugs. Since washing will give excess water to lettuce, drying was needed. These post-harvest activities of lettuce contribute to better quality product and higher prices in the market. Drying of lettuce are done manually and this will lead to high labor, time and money requirement. This operation was demanding as they required effective operation, low work effort, and low time requirement.

The study was conducted to design a batch-type lettuce spin dryer, fabricate batch-type lettuce spin-dryer using locally available materials, evaluate the performance of the lettuce spin-dryer in terms of loading capacity, efficiency, and damaged lettuce, establish the optimum operating speed and perform a cost analysis of the machine.

The lettuce spin-dryer has a dimension of 600mm diameter and 500mm height. It is powered by an 150W electric motor to spin the strainer basket. The machine consisted of strainer basket, outer cylindrical body, cylindrical lid, prime mover and caster wheels. It operates to remove excess water present on the surface of the freshly harvested and washed lettuce through centrifugation.

The machine was tested and evaluated using romaine lettuce found in San Jose City, Nueva Ecija. Performance parameters of the machine such as machine capacity, machine efficiency and damaged samples were evaluated using operating speed of 100rpm, 200rpm and 300rpm. The experiment was laid out in Completely Randomized Design (CRD). Sources of variation were presented in ANOVA tables. Comparison among means was tested using LSD at 5% level of significance.

Statistical results showed that the highest machine capacity of 8.64 kg/hr was obtained from 100 rpm centrifugal speed while the lowest machine capacity of 8.21 kg/hr was showed from 300 rpm centrifugal speed. On the other hand, the results showed that the speed of 300 rpm attain the highest machine efficiency of 80.04% while the speed of 100 rpm showed the lowest machine efficiency of 27.57%. In terms of percent damaged lettuce, it shows that highest speed (300rpm) attained more damaged lettuce of 11.78 % than the speed of 100 rpm of 2.66 %. Finally, cost analysis shows that the machine was financially viable. A breakeven weight of 23,182.98 kg/yr was calculated, indicating that the fixed and variable cost could be recovered. Moreover, the time required to recover the investment cost was 5 months.

Keywords: Lettuce; Spin-dryer; Design; Fabrication; Efficiency

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