

## Reviewer's evaluation

of **Dissertation Thesis** submitted by student **Ing. et Ing. Eduardo Duque Dussán, MBA.** named **"Design and performance of a solar dryer for processing of coffee beans in Colombia"**

Submitted Thesis has 157 pages including references and 8 appendices. Thesis begin with the Declaration and Acknowledgment of Funding, followed by the assignment of the doctoral dissertation, Abstract and table of contents. Before starting the work itself, a List of tables and a List of figures are also given. The work itself begins with an Introduction on page 1.

The submitted dissertation is a set of four works already published by the author in scientific journals. The Introduction on page 1 is followed by the Literature Review on pages 2-15. Main and Specific objectives of the thesis are then declared on page 16. This is followed by transcripts of four articles published by the author in journals included in the Web of Sciences database.

On page 17 begins the article "Modelling of Forced and Natural Convection Drying Process of a Coffee Seed", which was published in 2022 in the journal of the American Society of Agricultural and Biological Engineers (ASABE) named Journal of ASABE, formerly Transactions of the ASABE. The journal is in the third quartile (Q3) in the Agricultural Engineering section according to the Journal Citation Report and had an impact factor of 1.5 in 2022.

The second article entitled "Improving the Drying Performance of Parchment Coffee Due to the Newly Redesigned Drying Chamber", which was published in the scientific journal Journal of Food Processes Engineering also in 2022, starts on page 41. The journal is included in Q3 in the JCR category Engineering Chemical and Food Science & Technology and its impact factor in 2022 was 3.

A third article entitled "Thermophysical properties of parchment coffee: New Colombian varieties" was also published in the same journal, but in 2023.

The last article from the set of published papers is entitled "Design and evaluation of a hybrid solar dryer for postharvesting processing of parchment coffee" and was published in 2023 in the scientific journal Renewable Energy. This scientific journal falls into Q1 in the JCR category Energy & Fuels and Q2 in the Green & Sustainable Science & Technology category, and its impact factor in 2022 was 8.7.

The Literature Review chapter is a common introduction to the above articles. In this chapter, the advantages and disadvantages of coffee open sun drying technology are evaluated based on knowledge from the literature. Subsequently, solar drying technology is described, again with all the identified advantages and disadvantages. Then follows a description and evaluation of the advantages and disadvantages of more complex drying technologies, using mechanical and forced convection systems with regard to static and rotary technology. Everything is then completed by the description of the hybrid drying technology. This chapter is a link between individual published works and gives the reader, I think, a good general overview of coffee drying technology. It is a pity that some information is repeated (problems of sun drying) in the text and the quality of figure 5 on page 10 is bad, the texts on the figure are very small and therefore difficult to read.

The main objective of the submitted dissertation was to design a hybrid solar coffee drying unit for house-farm coffee growers in Colombia, which should improve drying efficiency compared to traditionally used systems. In order to achieve this objective, three specific objectives were defined. In total, there are four objectives. The achievement of each of them is documented in the thesis by four publications in scientific journals.

As soon as I got acquainted with all four articles, I could state that, in my opinion, all the objectives of the work were clearly achieved.

Assessing already published works is always easier for the reviewer of a doctoral dissertation, because their level has already been assessed by independent reviewers for the editors of the relevant scientific journals. If these reviewers found fundamental flaws, the manuscript would be rejected and the work would not be published in a scientific journal. Therefore, I will allow myself only a few small comments, which had a disturbing effect on me while reading these articles.

A considerable number of equations are presented in individual published articles. In some cases, I was missing physical units for these equations. Equation 13 on p. 52 can be cited as an example. In this case, it is a simple linear equation that is used to calculate bulk density based on moisture content in dry basis. Since the units for moisture content are percentages, it was appropriate to indicate the units for bulk density. In my opinion, it would contribute to the clarity of the work. A similar comment applies to a number of other equations presented in the work.

My second comment is about figures captions. In scientific work, it is generally true that a figure with a caption should be comprehensible even without the surrounding text. Unfortunately, this is not the case with many of the figures presented in the work. For example, figure 9 on p. 61. The figure caption tells that it is "Comparative stage temperature profile at 50°C". It is not clear, if the curves in a figure were approximated from measured values or are the results of some simulation. This should be clear from the figure and its caption.

However, all my previous comments do not reduce the value of the submitted dissertation and are rather intended as possible advice for the author's future scientific activities, if I can. On the contrary, based on the submitted publications, it was pleasant to observe the author's development in the ability to publish in good scientific journals up to the level of Q1.

Therefore, I have no doubt that the author has presented a timely and useful work with both scientific and practical implications, thus demonstrating the ability to do independent scientific work.

In conclusion, I would like to ask one question. Can it be estimated what percentage of Colombian farmers can potentially use hybrid solar drying technology?

Finally, I am glad to say that submitted work meets all the requirements for Ph.D. thesis and in the case of a successful defence **I agree that Ing. et Ing. Eduardo Duque Dussán, MBA. will achieve Ph.D. title.**

Prague, October 16<sup>th</sup>, 2023.

prof. Dr. Ing. František Kumhála