

SUPPLEMENTARY MATERIALS

Development of a Novel Helical-Ribbon Mixer Dryer for Conversion of Rural Slaughterhouse Wastes to an Organic Fertilizer and Implications in the Rural Circular Economy

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Table S1. Changes in drying rate and product moisture with the progression of time observed during the operation in LPG fuelled helical-ribbon mixer dryer

Time, t (min)	Moisture, x (%, wet basis)	Drying rate (dx/dt)	Moisture removal
0	85.37	0	0
15	84.42	0.06	0.95
30	81.9	0.168	3.47
45	72.36	0.43	13.01
60	62.86	0.633	22.51
75	53.38	0.632	31.99
90	43.83	0.635	41.54
105	34.31	0.634	51.06
120	24.79	0.634	60.58
135	19.09	0.45	66.28
150	15.56	0.23	69.81
180	15.56	0.23	69.81
195	15.56	0	69.81



Figure S1. Helical-ribbon mixer dryer dryer constructed based on Figure 1 and currently installed in one of the rural abattoirs of Magrahat, South 24 Parganas, West Bengal (India).

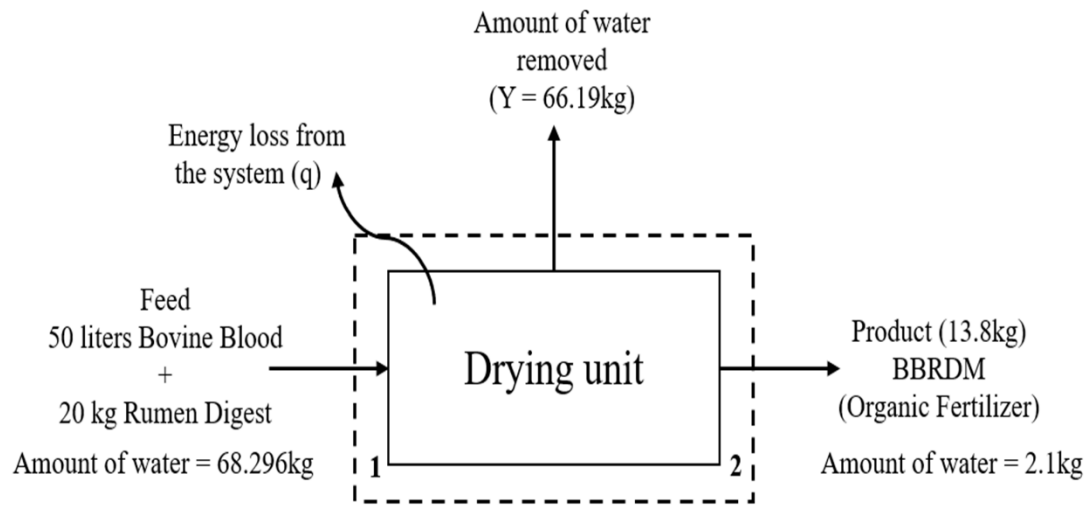


Figure S2. Mass balance of moisture removal from slaughterhouse waste in the developed helical-ribbon mixer dryer, where 1 and 2 represents input and output sides of the drying system, respectively.

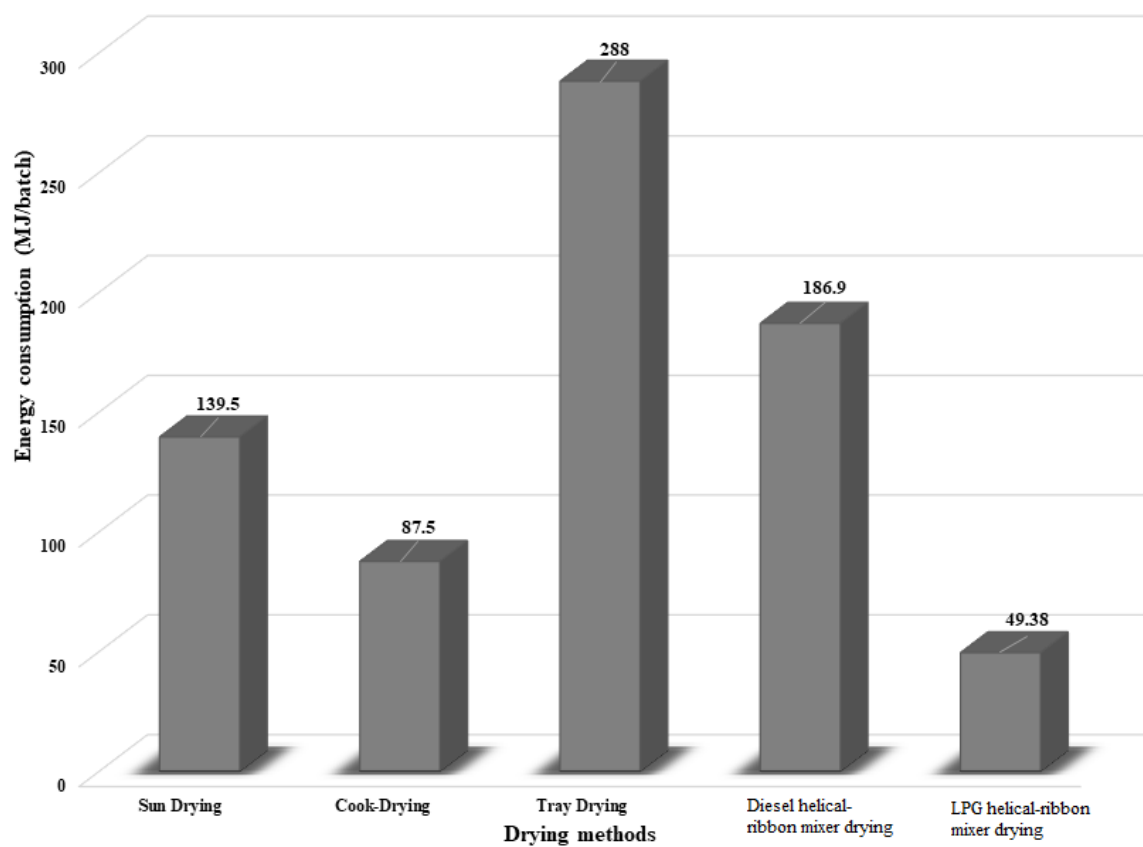


Figure S3. Drying techniques and their energy consumption adopted for rural slaughterhouse waste recycling in this study.

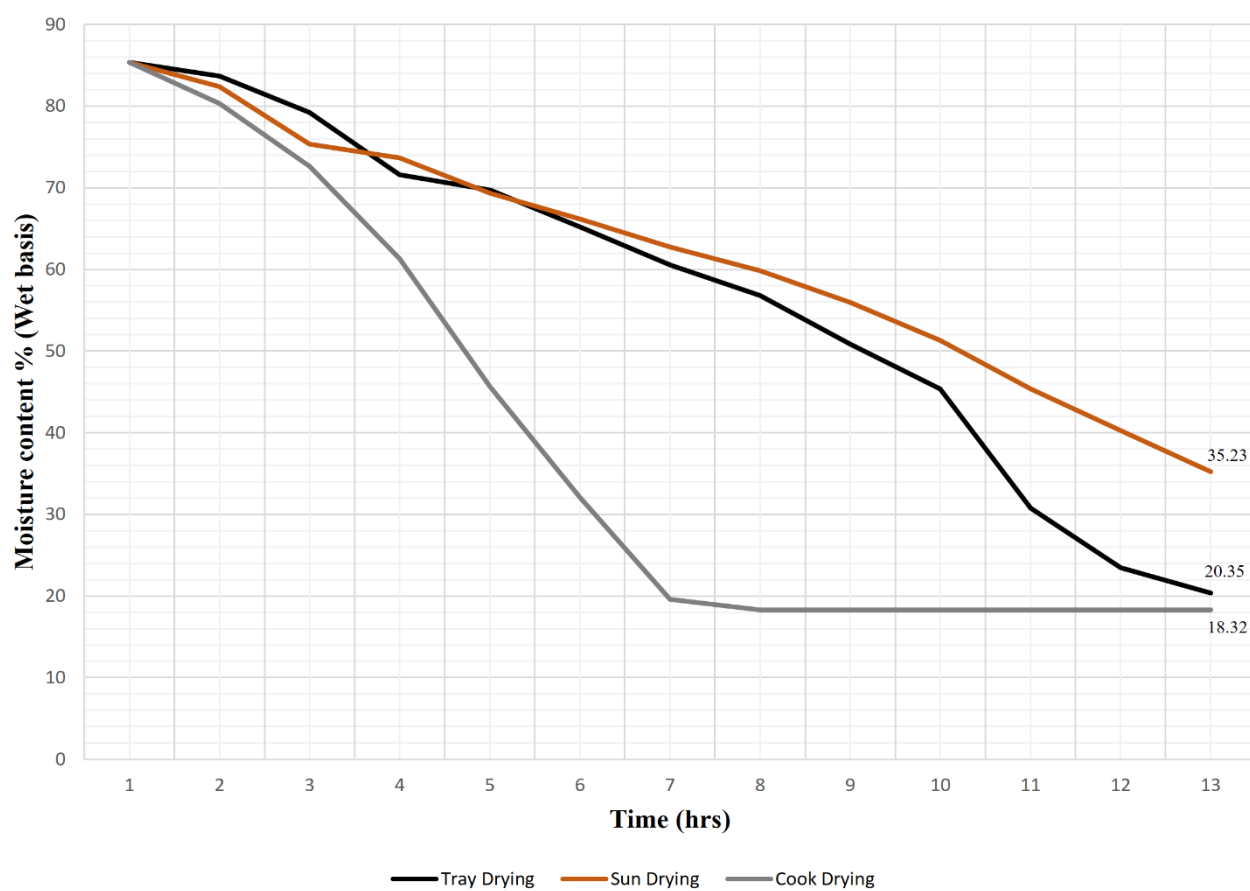


Figure S4. Comparative study of recycling alternatives applied previously to rural slaughterhouse wastes namely tray-drying, sun drying and cook-drying based on achieved final moisture after 13 hours of processing.



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PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

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पेटेंटी / Patentee : 1.Ms. Ankita Bhowmik 2.Mr. Shantanu Bhunia 3.Dr. Joydeep Mukherjee

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित AN APPARATUS FOR RECYCLING SLAUGHTERHOUSE WASTE AND METHOD THEREOF नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 1st day of August 2020 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled AN APPARATUS FOR RECYCLING SLAUGHTERHOUSE WASTE AND METHOD THEREOF as disclosed in the above mentioned application for the term of 20 years from the 1st day of August 2020 in accordance with the provisions of the Patents Act, 1970.



अनुदान की तारीख : 29/06/2021
Date of Grant :

पेटेंट नियंत्रक
Controller of Patent

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, 1st day of August 2022 को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।

Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on 1st day of August 2022 and on the same day in every year thereafter.