

## Optimization of Automatic Temperature Control System on Dehydrator

Rahmi Berlianti<sup>1</sup>, Dedi Kurniadi<sup>2\*</sup>, Budhi Bakhtiar<sup>3</sup>, Junaidi Asrul<sup>4</sup>, Aulia Oktavia<sup>5</sup>, Nadia Alfitri<sup>6</sup>, Yefriadi<sup>7</sup>, Berlianti<sup>8</sup>, Muhammad Abdurrafiq<sup>9</sup>  
Politeknik Negeri Padang

**Corresponding Author:** Dedi Kurniadi; [dedikurniadi@pnp.ac.id](mailto:dedikurniadi@pnp.ac.id)

### ARTICLE INFO

*Keywords: Dehydrator, DS18B20 Sensor, Heater, Dried Banana (Pisang Sale), Drying Process, Stable Temperature*

*Received : 5 October*

*Revised : 23 November*

*Accepted: 23 December*

©2025 Berlianti, Kurniadi, Bakhtiar, Asrul, Oktavia, Alfitri, Yefriadi, Berlianti, Abdurrafiq: This is an open-access article distributed under the terms of the [Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



### ABSTRACT

Traditional drying methods, such as sun drying, have several drawbacks, including dependence on weather conditions and long processing times. This final project aims to design and develop a dehumidifier device based on the Mamdani fuzzy logic system to process overripe bananas (locally known as pisang masak sehari) into dried banana (pisang sale). This type of banana ripens quickly, spoils easily, and is less favored in the market, thus requiring proper processing to increase its economic value. The developed device is equipped with an 850-watt heating element, an AC fan for air circulation, and three DS18B20 temperature sensors installed at three different points to ensure even heat distribution. The Mamdani fuzzy logic system is used to maintain a stable drying temperature within the range of 60–65°C. Test results show that the device is capable of drying bananas in 6 hours. The drying chamber temperature was maintained consistently at 61–63°C

## **INTRODUCTION**

Drying is a food preservation method that has been known for a long time, especially by utilizing sunlight. However, this traditional method has several disadvantages, such as dependence on weather, risk of contamination, and long drying times. Therefore, dehydrators have emerged as a modern solution in food processing. This tool is used to remove moisture from food materials to extend shelf life, prevent spoilage, and maintain nutritional quality (Adrolis SNR et al., 2023).

The use of dehydrator technology is one of the solutions to improve the quality and hygiene of dried products. This tool consists of heating elements, fans, and racks, allowing for faster and more hygienic drying with precise temperature and time settings. However, a common challenge faced by conventional dehydrators is temperature instability, which leads to inconsistency in product quality (Hasanah et al., 2015).

One of the common products that undergoes a drying process is sale bananas. Sale bananas are a dried product that has a distinct flavor and is quite popular. The drying process aims to reduce the moisture content in the bananas, thus inhibiting the growth of microorganisms that cause spoilage and extending the shelf life of the product. However, traditional drying methods such as sun drying are still widely used by the community, which has various disadvantages such as dependence on weather conditions, risks of contamination from dust and insects, and uneven temperatures during the drying process (Pinandita et al., 2024).

Efforts to extend the shelf life and increase the economic value of bananas are through processing them into banana chips, which is a dried product that has a distinctive flavor and is highly sought after. The drying process aims to reduce the moisture content in the bananas, thereby inhibiting the growth of microorganisms that cause spoilage and extending the shelf life of the product (Pratama et al., 2021). However, traditional drying methods using sun drying still have drawbacks such as dependence on weather, long drying times, risk of contamination, and inconsistent product quality. Based on information from research partner, Kadhijah Food in Bukittinggi, the traditional drying process takes 2-3 days due to relatively cool environmental temperatures. Therefore, the use of dehydrator equipment becomes an effective solution to accelerate the drying process, maintain product cleanliness, and produce more consistent and controllable quality (Mengabdi et al., 2024).

Several studies have been conducted to develop a drying tool for banana sale to overcome the limitations of traditional methods, such as the research by Cut Alna Fadhillah et al. (2024) that accelerates the drying process but still requires 10 hours, and the study by Awang Surya and Bina Age Aratama (2020) using solar energy that can reduce moisture content to below 40% in 212 minutes but lacks uniform heat distribution, as well as the research by Risty Jayanti Yuniar (2010) with PI control that can reduce moisture content by 20% at a temperature of 65°C but does not yield uniform results. Another study by Jeanyfer Amara Sunarto (2022) achieved a drying efficiency of 75.2% but with high electricity consumption. From various studies, shortcomings such as suboptimal heat

distribution, high energy consumption, long drying times, and limited capacity were still found. Therefore, this research aims to design and implement an automatic temperature control system based on Mamdani fuzzy logic using three DS18B20 sensors to ensure uniform temperature distribution. This system is expected to improve the efficiency of the drying process and produce banana sale products with more consistent and hygienic quality.

## LITERATURE REVIEW

### *Dehydrator*

A dehydrator is a food drying device used to reduce the moisture content of food materials, allowing the food to be stored longer and preserved. This device uses a combination of temperature, airflow, and appropriate timing to effectively dry food. The use of a dehydrator can enhance drying efficiency and maintain the quality of the dried products compared to traditional drying methods such as direct sun drying (Shodikin and Khailani, 2024).

### *Dried Banana (Pisang Sale)*

Dried Banana is a processed product made from semi-dry bananas that are made from ripe bananas which are prone to rotting if not processed or consumed immediately, often leading to wastage as consumers prefer fresh bananas. To reduce post-harvest losses, bananas can be processed into Dried Banana to extend their shelf life and increase their market value due to a higher market price (Safitri et al., 2023). The traditional drying process through sun drying takes 3-4 days in good weather and up to 6 days in bad weather (Ekasari et al., 2022).

Meanwhile, the use of a dehydrator can accelerate the reduction of moisture content more efficiently. According to SNI 01-4319-1996, the maximum moisture content for good dried bananas is 40% (Surya and Bina, 2020), and to calculate moisture content, a formula based on wet weight can be used, which is commonly employed in measuring percentage of water content (Pramono, 2019).

### *Air Circulation*

Air circulation is an important factor in the drying process, as it affects the efficiency of heat and moisture transfer from the product to the environment. Good airflow results in uniform temperature distribution and accelerates the drying process evenly throughout the dehydrator space. One method to assess the quality of air circulation is by comparing the temperature at several points using digital sensors like the DS18B20. Measuring the temperature at the top, middle, and bottom points can provide insights into the uniformity of hot airflow. The validation of temperature distribution in the rice drying chamber used three measurement points (Sample1-Sample3), concluding that the temperature variation between the points of 0.4-2.5 °C is still within tolerance limits, indicating good circulation (Wang et al., 2024).

### *Microcontroller*

Arduino Uno is a circuit board based on the ATmega328 microcontroller. This integrated circuit (IC) has 14 digital input/output pins (6 outputs for PWM), 6 analog inputs, a 16 MHz ceramic crystal resonator, USB connection, adapter socket, ICSP header pins, and a reset button. This is what is needed to easily

support the microcontroller to connect with a USB power cable or AC to DC adapter power supply cable or also a battery.

#### ***DS18B20 Sensor***

The DS18B20 temperature sensor is a digital temperature sensor based on one-wire communication, which only requires one data line pin to communicate with the microcontroller. Each sensor unit has a unique 64-bit serial number, enabling the use of multiple sensors in parallel on the same data line (shared bus). This feature is very useful in applications such as temperature data logging in complex temperature control systems.

#### ***Heater***

The heater is a main component in the dehydrator that functions as a heat source to efficiently reduce the moisture content in bananas. In this system, the heater works by converting electrical energy into heat, which is then transmitted into the dehydration chamber with the help of a blower. The type of heater used is usually an electric heating element, such as a finned tubular heater or nichrome wire heating element. For this dehydrator, it is planned to use a Finned Tubular Heater with a power of +/- 850 watts, capable of producing heat in the temperature range of 30–90°C.

#### ***Air Conditioner***

A good air circulation system, supported by optimally functioning fans, also ensures that heat is distributed evenly throughout the shelves or layers of material, especially in dehydrators with multiple shelf levels. This is crucial for ensuring that all products undergo consistent drying and have a uniform final quality.

#### ***Power Supply***

A power supply is a circuit of electronic components designed to supply electrical power to one or more electronic devices. In addition to being a power source, a power supply can also function as a converter of various forms of energy such as solar, mechanical, or chemical energy into electrical energy. One common type of power supply used in electronics and automation systems is a power supply with an output voltage of 12 volts and a current of 5 amperes, which produces a total power of 60 watts.

#### ***Keypad 4x4 Matrix***

The 4x4 matrix keypad is an input device in the form of a key panel consisting of 16 buttons arranged in a format of 4 rows and 4 columns. Each button is located at the intersection of one row and one column, allowing it to be accessed through a combination of row and column pins. To detect which button is pressed, a scanning method is used alternately on each column and the values are read on the rows.

#### ***AC Dimmer***

AC Dimmer is an electronic circuit designed to control the amount of alternating current (AC) voltage supplied to a device, such as a light, fan, or heating element. By adjusting the voltage sent to the load, the dimmer allows users to control the level of light intensity, rotational speed, or heating power according to their needs. The operating principle of this dimmer is generally based on the phase angle control method, where the AC wave is 'cut' at a certain

point in each half-cycle so that only a portion of the energy is delivered to the load.

#### ***LCD (Liquid Crystal Display)***

The Liquid Crystal Display (LCD) data viewer is an electronic component that serves as a display for characters, numbers, letters, and even graphics. The LCD used in this final project is a 20x4 character LCD with an additional I2C chip module to facilitate programmers in accessing the LCD later. This is because the use of the I2C module will save more pin usage that will be employed.

#### ***NodeMCU ESP8266***

This IoT circuit board is equipped with the ESP-12E module, which has an ESP8266 chip operating at a frequency of 80-160MHz and is configurable and supports RTOS (Real-time Operating System). This NodeMCU comes with 128kB of RAM and 4MB of flash memory (for programming and data storage). This capacity is sufficient to store a large number of strings for web page needs, JSON/XML data, and anything that can be sent by current IoT devices.

#### ***Fuzzy Logic Control***

Fuzzy logic was developed by Prof. L. Zadeh in the 1960s to address the limitations of Boolean Logic, which has low precision, by using a membership range of 0-1 expressed linguistically, such as cold, normal, and hot temperatures. In this study, the Fuzzy Mamdani (FM) method was used as a temperature control system in the dehydrator because it is more flexible, intuitive, and capable of providing more specific decisions with a lower error rate (19.76%) compared to the Tsukamoto method (39.03%) and Sugeno method (86.41%), making it more suitable for decision-making that requires data tolerance and human input (Sunanto et al., 2021).

### **METHODOLOGY**

This research uses a system engineering experimental method to design and test an automatic dehydrator with a temperature controller based on fuzzy logic. It goes through several stages such as:

#### ***Block Diagram***

The block diagram of this automatic banana slice dehydrator system illustrates an integrated working process that utilizes the DS18B20 sensor, Arduino Uno, dimmer, relay, heater, fan, and keypad to automatically control the temperature within a range of 60-65 °C. The system can raise or lower the temperature as needed by adjusting the power of the heater and the circulation of hot air, making the drying process more stable, consistent, and efficient without relying on external conditions.

#### ***Work System***

The automatic temperature control system in this dehydrator works by combining DS18B20 sensors, a microcontroller, and fuzzy logic inference methods to maintain the temperature according to the setpoint input through a keypad. The temperature is classified into Low, Ideal, and High, then the system automatically adjusts the heater and fan: the heater operates at full power when the temperature is low, decreases to nearly 0% when the temperature is high, and operates at 50% when the temperature is ideal, with the fan always running for

temperature distribution. This system uses a closed loop with periodic monitoring, making the banana sale drying process more efficient, stable, and in accordance with actual conditions.

### **Hardware Design**

The design of the hardware for this banana drying dehydrator consists of two main parts, namely electronic design and mechanical design. On the electronic side, the system combines various components such as the DS18B20 sensor to read temperature, a relay to control the AC fan, an AC dimmer to adjust the heater voltage, a 20x4 LCD with an I2C module for displaying information, a keypad as an input for settings, and a NodeMCU ESP8266 for online temperature data monitoring. All components are connected through an Arduino Uno as the control center. Meanwhile, the mechanical design includes the physical construction of the device made of stainless steel with dimensions of 42 × 55 × 38 cm, equipped with 10 racks for bananas, an 850 W heater, a circulation fan, and a component space at the top, so the system can work in a structured, tidy, and efficient manner in the drying process.

### **Software Design**

The design of a temperature control software system for the banana sale dehydrator based on fuzzy logic involves the preparation of a main flowchart and a fuzzy method flowchart that outlines the workflow from initializing the DS18B20 sensor, input through a keypad, processing temperature data, to controlling the heater and fan actuators. The fuzzy process is carried out through three main stages: fuzzification to convert temperature values into linguistic variables (Low, Ideal, High), applying a rule base that determines control actions based on IF-THEN rules, and defuzzification that converts fuzzy outputs into heater power values (Low, Medium, High) automatically. This system operates in a closed loop with periodic data readings, thereby maintaining drying temperature stability in the range of 60–65 °C efficiently, stably, and adaptively to changing conditions.

## **RESULTS AND DISCUSSION**

### **Testing and Analysis of the DS18B20 Sensor**

The DS18B20 sensor functions to read the temperature inside the drying machine. This sensor is positioned at three points, namely the top right front, bottom right back, and middle left center. This is aimed at identifying the temperature distribution inside the drying chamber.

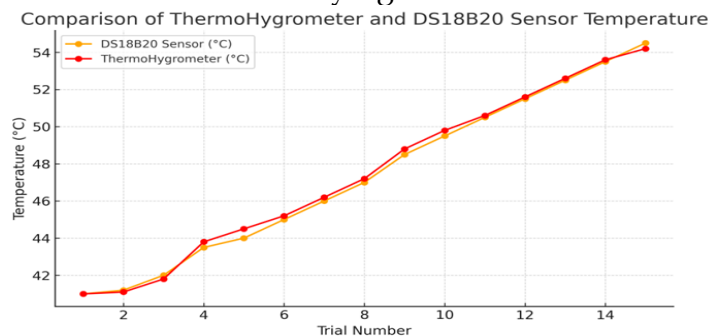


Figure 1. Comparison of ThermoHygrometer Temperature and DS18B20 Sensor

The results of testing the DS18B20 sensor on the banana drying tool show that this sensor is installed at three points (top right front, bottom right back, and middle left center) to monitor temperature uniformity in the drying space, with the setpoint taken from the average of the three sensors. The testing was conducted by comparing the sensor readings with those of a digital hygrometer thermometer to verify accuracy. The temperature difference between the sensor and the standard measuring instrument is relatively small, with an average deviation of about 0.4°C and an average error percentage of only 0.70%.

This result proves that the DS18B20 sensor is quite accurate and can be relied upon for temperature control, although there are factors that can affect accuracy such as sensor response speed, uneven air circulation, differences in installation positions, and potential heat spots from the heater. This validation is important considering that the banana sale drying process requires a stable temperature in the range of 60°C–65°C to maintain the texture and flavor of the product. Measurements were taken when the heater was turned off to avoid bias from local heat, so that the results can serve as a more accurate calibration reference in the design of microcontroller-based automatic temperature control.

#### ***Testing and Fuzzy Analysis on Heater***

At this stage, testing is conducted to assess the accuracy level of the Mamdani fuzzy logic against the dimmer output of the AC controlling the heater, by performing direct measurements on the device. The aim of this test is to determine to what extent Mamdani fuzzy logic can accurately control the heater power.

The test results show that the Mamdani fuzzy logic-based temperature control system is capable of adaptively adjusting the heater power according to temperature changes. At low temperatures (30–60 °C), high power is used (215 V; 3.95 A; 849.25 W) to accelerate heating. As it approaches the ideal temperature (62–64 °C), the power is reduced to medium (135 V; 2.00 A; 270 W), and at high temperatures (70–75 °C), it becomes low (10 V; 0.40 A; 4 W). The temperature stabilizes around 62–64 °C in the first 5–6 minutes and remains constant throughout the process, with even heat distribution, demonstrating that fuzzy control operates efficiently and stably.

#### ***Testing and Analysis of Banana (Pisang Sale) Drying Equipment***

Testing and analysis are conducted to determine whether the tool has been created as desired. This can be seen from the results obtained during the tool testing.

#### ***Testing With The Sun***

In this test, the drying process of bananas was carried out using sunlight with five samples. Each sample was dried for two consecutive days, unless hindered by rainy weather, which required longer drying time. Each sample consisted of five trays, and each tray contained 350 grams of banana slices with a thickness of approximately  $\pm 3$  mm. Weight measurements were taken every two hours during the drying process, which lasted from 09:00 to 17:00. The drying was conducted alternately from July 13 to July 19, 2025, with the schedule divided as follows: the first sample was dried on Sunday and Monday, the

second on Tuesday and Wednesday, and so on alternately until the five samples were fully tested.

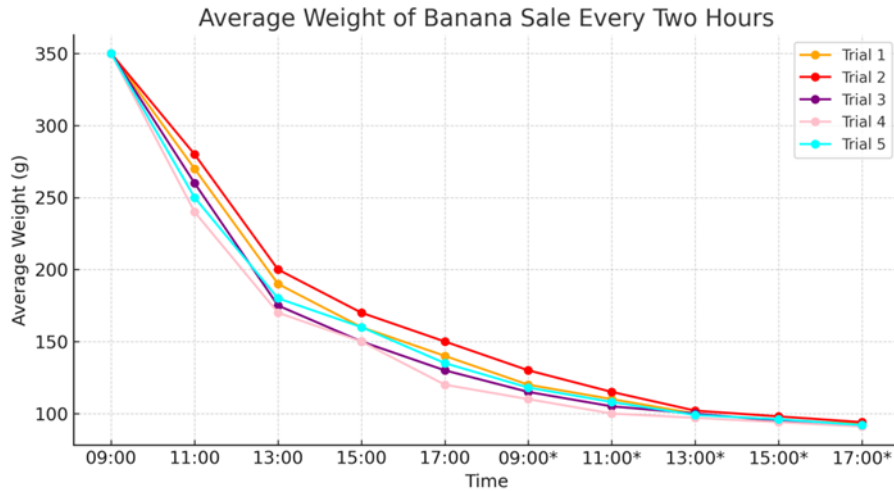


Figure 2. Average Weight Loss Graph

From the five experiments, a graph of the average weight measurement of bananas was obtained, showing a consistent weight decrease trend every two hours during the drying process. This indicates a gradual evaporation of moisture content over time. The most significant decrease occurred on the first day, especially between 9 AM and 3 PM, which demonstrates the effectiveness of drying during those hours. After the second day, the weight loss tends to slow down, indicating that the moisture content in the bananas is becoming less and the drying process is nearing completion. This pattern reflects an effective natural dehydration process during drying. It can be concluded that sun drying bananas at the fastest requires 2x8 hours or 16 hours in sunny weather conditions.

**Testing with a Dehydrator**

Subsequent testing was carried out using a dehydrator with a method similar to the sun-drying testing process. The testing was conducted five times, where each trial used five trays, each containing bananas weighing 350 grams with a slice thickness of approximately 3 mm. The testing process took place from July 17 to 22, 2025. Weighing was done every two hours to monitor the weight change of the bananas and the level of moisture reduction, with the drying temperature maintained in the range of 60–65°C.

Table 1. Summary data of the experiment with the Dehydrator

No	Date	Initial Weight (g)	Final Weight (g)	Total Depreciation (g)	%Depreciation	Description
1	17 July 2025	1.750	496	1.254	71,66%	Initial Weight = Total
2	18 July 2025	1.750	480	1.270	72,57%	

3	19 July 2025	1.750	511	1.239	70,80%	weight of 5 trays (350g x 5)
4	21 July 2025	1.750	533	1.217	69,54%	
5	22 July 2025	1.750	494	1.256	71,77%	

And the graph of the average weight loss of banana chips from each tray with the dehydrator every 2 hours is as follows.

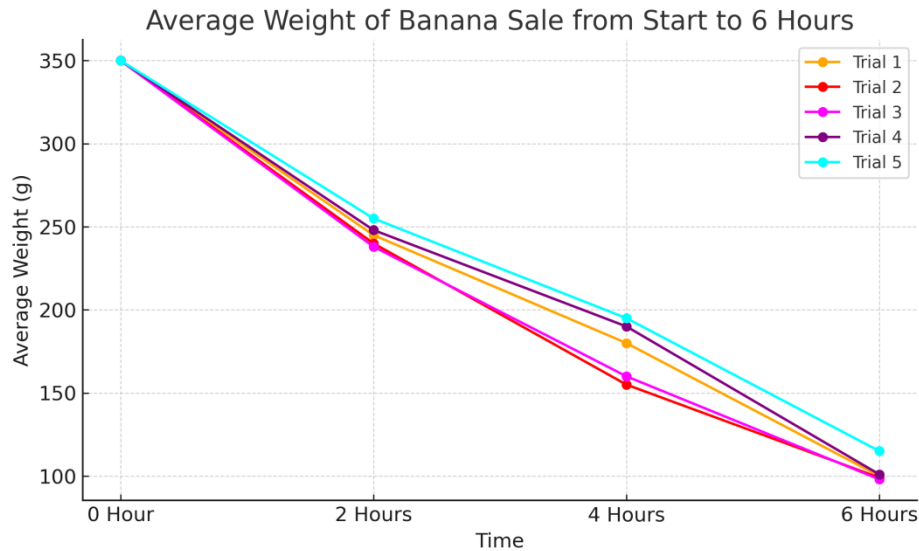


Figure 3. Graph of Banana Weight Reduction with Dehydrator

From five trials of drying banana sale using an automatic temperature control-based dehydrator (60–65 °C for 6 hours), it was shown that the device is capable of working consistently and efficiently in reducing the moisture content of the bananas. Each trial resulted in a weight reduction of 69.54% to 72.57%, with a final moisture content between 27% and 30%, approaching the standard for good-quality dried banana sale. The recorded temperature remained stable within the desired range, with relatively even heat distribution thanks to the aid of circulating fans. The color of the dried bananas is generally yellowish-brown, with a slightly soft texture but not breaking when bent, resembling the results of sun drying. This proves that the dehydrator can accelerate the drying process from the usual 16 hours (traditional drying) to just 6 hours, with comparable quality results and more practical since it does not rely on weather conditions.

### CONCLUSIONS AND RECOMMENDATIONS

This research was conducted using a dehydrator prototype measuring 42 cm × 55 cm × 38 cm, specifically designed to test processed bananas as the main commodity. An automatic temperature control system based on fuzzy logic has been successfully designed and operates according to its goal, which is to maintain temperature stability during the drying process of banana sale. The stable temperature achieved during drying is in the range of 61–63 °C with a setpoint of 60–65 °C. And the uniform temperature distribution on each rack is

monitored through three temperature sensors with a difference of only 0.4–2.5 °C, thanks to a hot air circulation system using a fan.

### **FURTHER STUDY**

Before implementing fuzzy logic, it is important to understand the basic concepts of fuzzy logic, including membership functions, inference, and the defuzzification process. This understanding will facilitate the determination of parameters and fuzzy rules that are suitable for the characteristics of the drying system. For future research, it is recommended to collect more varied data under different environmental conditions. This aims to refine the fuzzy rules and improve the system's accuracy in producing banana sale products with more consistent and optimal quality.

### **ACKNOWLEDGMENT**

The author wishes to express the utmost gratitude to Allah SWT for His blessings and guidance during the completion of this research. Special thanks are extended to the advisors, Mrs. Nadia Alfitri, ST., MT. and Mr. Dedi Kurniadi, S.ST., M.Sc., for their constructive guidance, input, and invaluable encouragement throughout the process of preparing this research. The author also expresses deep gratitude to the Department of Electrical Engineering, Padang State Polytechnic, for the facilities, resources, and support provided, which made this work possible. Lastly, heartfelt thanks are given to the author's family and friends for their prayers, moral support, and motivation that significantly contributed to the success of this project and the research preparation.

### **REFERENCES**

- Adrolis, I. S. N. R., Wahyuni, R., Syari, N., Sirait, D. L. K., Syakirah, V. R., & Hang Tuah Pekanbaru, U. (2023). Smart food dehydrator berbasis IoT untuk menghasilkan cemilan sehat (IoT-based smart food dehydrator to produce healthy snacks). *Journal of Information Technology and Computer Science*, 6(2), 954–958.
- Abrori, M., & Prihamayu, A. H. (2015). Aplikasi logika fuzzy metode Mamdani. *Kaunia*, 11(2), 91–99.
- Cendi, P., & Ardi, P. (2014). Media pembelajaran himpunan fuzzy berbasis multimedia. *Jurnal Sarjana Teknik Informatika*, 2(2), 1176–1184.
- Ekasari, N., Syarif, A., Edward, E., Machpuddin, A., & Chairunnisa, F. (2022). Optimalisasi proses produksi sebagai sarana peningkatan hasil produksi keripik pisang sale JA3R di Desa Pudak Kecamatan Kumpeh Ulu Kabupaten Muaro Jambi. *Jurnal Inovasi, Teknologi dan Dharma Bagi Masyarakat*, 4(1), 12–15. <https://doi.org/10.22437/jitdm.v4i1.19538>
- Hasanah, U., Mayshuri, & Djuwari. (2015). Analisis nilai tambah agroindustri sale pisang di Kabupaten Kebumen (The value added analysis of sale

- pisang agroindustry in Kebumen Regency). *Jurnal Ilmu Pertanian*, 18(3), 141-149.
- Makky, M. (2008). Rak dengan sistem hybrid untuk pengeringan. *Jurnal Teknologi Pertanian Andalas*, 12(2), 19-25.
- Mengabdi, J. M., et al. (2024). Pengembangan alat pengering pisang sale untuk meningkatkan kualitas produksi dan pemberdayaan ekonomi masyarakat kampung. *Jurnal Pengabdian*, 3(2), 392-398.
- Pinandita, S., Supari, S., Saputra, D. N., & Al Amin, A. F. (2024). Analisa mesin pengering makanan food dehydrator menggunakan sensor thermostat berbasis hybrid. *Elkha: Jurnal Rekayasa dan Teknologi Elektro*, 18(1), 97-103. <https://doi.org/10.23960/elc.v18n1.2582>
- Pratama, M. R., Yulianti, A., Sulistiyani, D., & Salafudin. (2021). Pengeringan buah pisang dengan metode pengeringan sistem tertutup menggunakan zeolit pada suhu rendah. *Prosiding Diseminasi FTI Generasi*, 1(3), 12.
- Pramono, Y. B., & Nurwantoro, N. (2019). Evaluasi kadar gula, kadar air, kadar asam dan pH pada pembuatan tablet effervescent buah nangka. *Jurnal Teknologi Pangan*, 3(1), 36-41. <https://doi.org/10.14710/jtp.2019.20519>
- Rauf, F. R., & Rivai, A. A. (2023). Pengaruh suhu pengeringan pada food dehydrator terhadap karakteristik psikokimia dan mutu hedonik asam mangga kering. *Jurnal Pendidikan Teknologi Pertanian*, 9(2), 273-289. Retrieved from <https://journal.unm.ac.id/index.php/ptp/article/view/667>
- Safitri, D., Sriningsih, E., & Nurdiani, U. (2023). Studi kelayakan UMKM: Potret analisis bisnis keripik sale pisang di Kecamatan Wangon, Kabupaten Banyumas. *Biofarm: Jurnal Ilmiah Pertanian*, 19(2), 303. <https://doi.org/10.31941/biofarm.v19i2.3552>
- Surya, A., & Aratama, B. A. (2020). Alat pengering sale pisang dengan energi surya. *JTTM: Jurnal Terapan Teknik Mesin*, 1(2), 54-66. <https://doi.org/10.37373/msn.v1i2.35>
- Shodikin, M. B., E. S. I., & Khailani, E. R. (2024). Analisis kinerja food dehydrator dalam mengurangi kadar air pada daun salam. *Prosiding SAINTEK*, 6(November), 77-82. <https://doi.org/10.29303/saintek.v6i1.921>
- Sunanto, S., Firdaus, R., & Siregar, M. S. (2021). Implementasi logika fuzzy Mamdani pada kendali suhu dan kelembaban ruang server. *Jurnal*

*Berlianti, Kurniadi, Bakhtiar, Asrul, Oktavia, Alfitri, Yefriadi, Berlianti, Abdurrafiq*

*CoSciTech (Computer Science and Information Technology)*, 2(2), 128–136.  
<https://doi.org/10.37859/coscitech.v2i2.3362>

Yudantoro, T. R., et al. (2019). Penerapan smart food dehydrator berbasis IoT pada toko buah KAMTI Widodo. *Prosiding Seminar Nasional Hasil Penelitian dan Pengabdian Masyarakat Polines*, 3, 103–111.