

## Arduino Based Automatic Banana Chip Slicer

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### ABSTRACT

Banana is a herbaceous fruit plant, in Latin banana *Musa spp* which belongs to the Musaceae family from Southeast Asia. What is meant by superior varieties is that banana plants are strong enough to withstand pests and diseases so they are capable of high production. Nowadays, many people who slice bananas still use simple or manual tools to slice raw bananas. An efficient machine mechanism must be needed in the manufacturing process to get these thin banana slices. This tool aims to avoid hand injuries and banana sap getting on your hands if you use a manual banana slicer. The working method of this tool is controlled by Arduino Uno R3 using an Ir sensor and with an output in the form of a relay which functions as a switch to rotate the blade. This test was carried out fifty times using three different types of bananas, namely, wak bananas, kapok bananas, and flower bananas. The results of testing three types of bananas, namely weak bananas, kapok bananas, and flower bananas, have the same thickness level, namely 1mm. This tool concludes that it makes it easier for people to slice bananas from manual to automatic so that the thickness is the same. The tool works based on input from two IR sensors using an analog signal pin connected to Arduino. The two IR sensors will detect if there is movement near the container.

### INTRODUCTION

Banana is a herbaceous fruit plant, in Latin banana *Musa spp* which belongs to the Musaceae family from Southeast Asia. Bananas can be called superior seeds, what is meant by superior varieties is that banana plants are strong enough to withstand pests and diseases so they are capable of high production. so the quality of the fruit is good and liked by the wider community, but the bananas that we encounter in daily life are still limited to garden plants or people's plantations which are not managed intensively. So the opportunities for developing banana commodities are still wide open (Daryono et al., 2019). The main problem faced in the process of making chips is that the process is still traditional, namely using a kitchen knife or using a wooden board and placing a knife in the middle. This method endangers the operator's fingers by causing injury during slicing. Apart from that, this method requires a lot of human labor, takes a long time, the shape and thickness are not uniform, and is less hygienic (Ardiansyah et al., 2022). To solve this problem, a banana chopper machine is used to increase time efficiency and productivity.

### LITERATURE REVIEW

Research conducted by other researchers using Arduino or infrared sensors includes Designing an IoT-based footstep counter for sports shoes (Aditya et al., 2023). Prototype of Automatic Cable Cutting Tool Based on Length and Number of Cuts Based on Arduino (Raharja & Suhilman, 2017). Arduino Automatic Onion Slicer Uno and Android (Nugraha et al., 2019). Design of an Automatic Vegetable Slicer Based on Thickness Based on Arduino Uno (Zamhuri et al., 2022). Design of a Smart Hand Washing Tool Using an Arduino-Based Infrared Sensor (Aldo Fadila Putra et al., 2021). Design and Performance Test of a Banana Chip Cutter Machine with Four Horizontal Knives (Dharmawan et al., 2022). Design an Arduino Uno-Based Automatic Grass-Cutting Robot with the Blynk Application Control System (Dedi Irawan & Endah Fitriani, 2021). Design an Arduino Uno-Based Automatic Grass-Cutting Robot with the Blynk Application Control System (Samsiana, 2019).

### METHOD

#### Design Scheme

This block diagram was created to simplify the process of designing an Automatic Banana Slicer Using Arduino. The Automatic Banana Slicer Circuit Using Arduino consists of four parts, namely the input part, control part, display part, and output part.





Figure 1. System Design Diagram

#### Input Section

The input section consists of an infrared sensor that functions to detect if there is a banana that you want to slice and sends a signal to Arduino R3.

#### Control Section

The control section of this Automatic Banana Slicer consists of Arduino R3 which functions to receive input or signals from sensors so that it can be processed further in the output section.

#### Output Section

The output section consists of a DC motor which functions as a tool for slicing bananas.

The hardware specifications used in this research are shown in table 1 below:

Table 1. Hardware and Specifications

No	Hardware	Specification
1	Arduino Uno	R3
2	Infrared Sensor	3-5 Volt
3	Starter dynamo	12-36 Volt
4	Relay Module	5 Volt
6	Breadboards	Mini
7	Resistors	200 ohm
8	Dry battery	12 Volt
9	Triplex	12x50 cm
9	Jumper Cables	Male To Male, Male To Female

#### Software Design Flowchart

This software design flowchart functions to regulate the overall performance of a system consisting of several hardware devices so that this system can work well. Software designed using the Arduino IDE. To provide a general overview of the course of the program and make it easier to create software, a flow diagram is created that shows the course of the program. The following is a software design flowchart for the Automatic Banana Slicer program flow using Arduino.

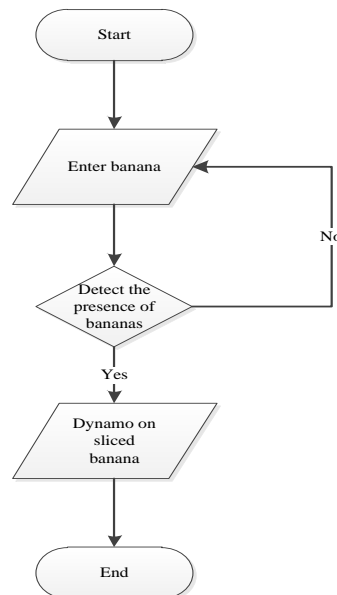


Figure 2. Program Flow Diagram

From Figure 2 above, it can be seen that when the system starts running, the infrared sensor which functions as a detector if there is a banana that you want to slice, will process the input by giving a command to the Arduino and then continue by turning on the Starter Dynamo which will rotate to slice the banana according to the program. will be created and uploaded to the Arduino board.

## RESULT

### The results of the tool series

The automatic banana chip slicing tool using Arduino works based on input from two IR sensors using an analog signal pin connected to Arduino. The two IR sensors will detect if there is movement near the hole where the banana will be inserted to be sliced using a dynamo as the circular drive of the board that has been prepared. equipped with a knife.

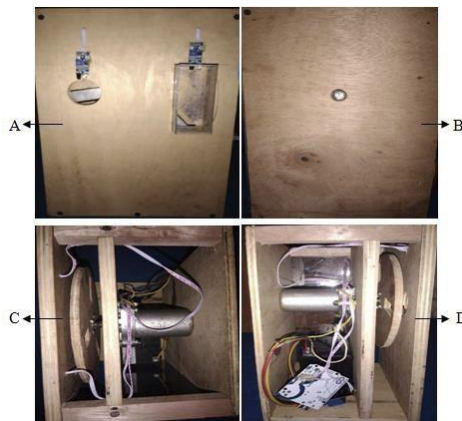


Figure 3. Results of the tool set

Information:

- a. Front position
- b. Rear position
- c. Top position
- d. Right side position

### Testing Procedure

Tool testing is carried out in stages starting from testing the two IR sensors, relays, and dynamos, and testing the entire tool.

#### IR sensor testing

IR sensor testing is carried out to determine whether the sensor as an input that will detect the presence of bananas to be sliced is working properly, according to the working system. The first step is to connect the cables from the IR sensor to the Arduino board, connect the Arduino board to the computer via a USB cable, then create a sketch program and upload it to the Arduino board.

#### Relay and dynamo testing

Relay and dynamo testing is carried out to find out whether the relay and dynamo are working and functioning as output properly and by the commands given by the Arduino. The signal pin on the relay is connected to pin 13 on the Arduino, and the VCC and GND pins are connected to 5V. and GND on the Arduino, which means the Arduino will give commands via the relay signal pin which functions as a switch to turn on and off the dynamo as a banana slicer which has been fitted with a knife blade for slicing bananas via the output pin on the relay, namely the NO pin on the relay which is connected to the positive side of the battery/adaptor, the OM pin on the relay is connected to the positive side of the dynamo, the negative side of the battery/adaptor is connected to the negative side of the dynamo. The testing steps are as follows:

1. Connect the power supply and relay according to the pins used on the Arduino board.
2. Connect the Arduino board to the computer via a USB cable.
3. Make a sketch program and upload it to the Arduino board.

### Testing DC dimmers and batteries

DC dimmer and battery testing are carried out to inhibit the current from the battery of 12 volts 3 amperes so that the starter dynamo which is attached to the blade does not rotate too fast to minimize the banana being sliced from being crushed, the pin used on the dimmer is the positive-negative pin which is connected to the battery and the positive pin for the dynamo is connected to the relay and the negative pin on the dimmer is connected to the negative pin on the dynamo.

Table 1. Test results of the Wak banana slicer

Testing	Sliced banana	Thickness Measurement
First	Banana Wak	1 Milli Meter
Second	Banana Wak	1 Milli Meter
Third	Banana Wak	1 Milli Meter
Fourth	Banana Wak	1 Milli Meter
Fifth	Banana Wak	1 Milli Meter

This research was carried out on wak bananas where the sensor will detect if there is a banana to be sliced and inserted into a hole, then the dynamo which has been set at speed using a dimmer will rotate to slice the banana with a thickness that has been adjusted with the blade. And the tool's accuracy rate reaches 100%.

Table 2. Testing on flowering bananas

Testing	Sliced banana	Thickness Measurement
First	Banana Wak	1 Milli Meter
Second	Banana Wak	1 Milli Meter
Third	Banana Wak	1 Milli Meter
Fourth	Banana Wak	1 Milli Meter
Fifth	Banana Wak	1 Milli Meter

The second test was carried out on flowering banana types. If the banana is to be sliced and inserted into the hole, the dynamo which has been set at speed using a dimmer will rotate to slice the banana with a thickness of 1mm.

Table 2. testing on Kepok bananas

Testing	Sliced banana	Thickness Measurement
First	Banana kepok	1 Milli Meter
Second	Banana kepok	1 Milli Meter
Third	Banana kepok	1 Milli Meter
Fourth	Banana kepok	1 Milli Meter
Fifth	Banana kepok	1 Milli Meter

The third test was carried out on the Kepok banana type. If the banana is to be sliced and inserted into the hole, the dynamo which has been set at speed using a dimmer will rotate to slice the banana with a thickness of 1mm.

### DISCUSSION

From the results of the tests that have been carried out, each sliced banana has a different level of hardness, both banana wak, banana flower, and banana kepok, among the three bananas that have been sliced, banana wak is harder than banana flower or banana kepok, so the speed of the dynamo you have to spin faster so that the wak banana can be sliced and the circle of the knife doesn't stop, flower bananas and kepok bananas are easier to slice because they are not too hard like wak bananas, and the speed of the dynamo can also be set to be slower so that flower bananas and kepok bananas don't get crushed and get results 1mm thick.

### CONCLUSION

After designing and realizing the automatic banana slicer based on Arduino Uno and then testing the tool, both in the form of each series and as a whole. So it can be concluded:

1. Make it easier for people to slice bananas from manual to automatic so that the thickness is the same.
2. To avoid sap and accidental hand injuries when slicing bananas.

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