

# THE TOOL FOR WRAPPING BAGS AND PICKING FRUITS

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## Abstract

The act of picking fruit is very familiar and associated with the history of hunting, catching, gathering, and gathering of humans, so they have come up with many types of tools for this job. The practice of wrapping fruit in bags before harvest has only been applied recently, so it is still very new and rudimentary. These tools only perform each function individually. Therefore, the author has inherited and proposed a tool that has two functions at the same time: wrapping bags and picking fruit at high altitude. This article presents the structure, operating principles, and instructions for using this tool. This tool is compact, inexpensive, and easy to use. It consists of a long handle, a set of clamps that close and open, and a control cable connecting from the top to the middle of the handle. Farmers just need to stand on the ground, put the clamps over the fruit, and pull the control cable to make the clamps close or open. From there, they can wrap bag or pick fruits from high above easily. This research will help farmers have a tool that has two functions, which certainly has many advantages and is useful for farmers.

**Keywords:** cloth bags, cover fruit bags, fruit pickers, plastic bags, tools

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## 1. Introduction

Our country produces many types of fruits, such as mango, guava, jackfruit, mangosteen, rambutan, durian, banana, dragon fruit, custard apple, grapefruit, etc. Therefore, caring for and harvesting fruit is work takes up a lot of human labor. To have delicious fruit with a beautiful outer fruit surface, it is indispensable to use bags for young fruit to prevent fruit borers, yellow flies stinging, leafhoppers sting, sucking sap and clinging, and fungal spores spreading through the air. However, currently, the process of wrapping fruit bags is all done manually, i.e., completely using human power.

We know that climbing high trees to pick fruit is unsafe and very dangerous to life if an unexpected accident occurs, so standing on the ground and still picking fruit is something that many farmers want. The same goes for wrapping fruit in bags. Farmers really want a convenient tool, so they can do this just by standing on the ground. Bag the fruit when it is still young to create beautiful and high-value fruits. In addition, in many cases, farmers want to let the fruit grow naturally and do not want to use pesticides needed to minimize the amount of pesticides to protect the environment, thereby harvesting clean and safe fruit products, ensuring human health (Figure 1).

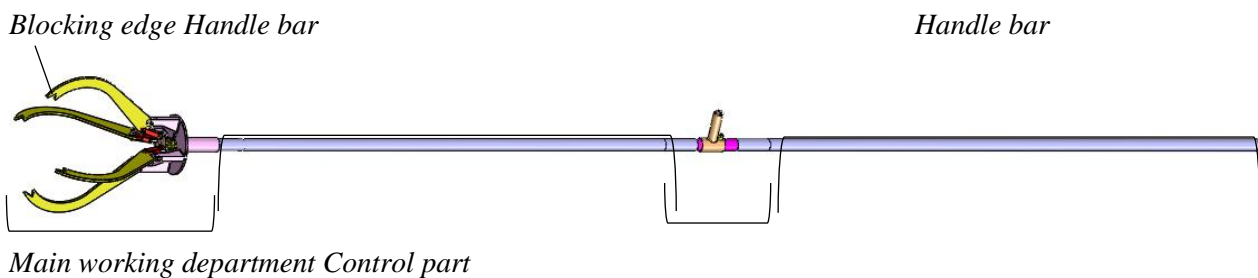


**Figure 1.** Farmers cover the fruit with plastic bags or cloth bags

Source: <https://shopdieutam.com/tui-boc-trai-cay/>

Currently, there are many types of fruit picking tools on the market because picking fruit for human consumption has existed since ancient times. People have even come up with fruit-picking robots. However, up to now, the tools used to cover high-altitude fruit bags to prevent boring insects are still very rudimentary. Many farmers, when they want to bag high-altitude fruit, force them to use ladders to climb trees and reach out to far and high branches to wrap the fruit. Trees such as oranges, mangoes, guavas, custard apples, etc. have a lot of fruit, and the fruits do not grow close to each other, so the farmer has to move the ladder from one side to the other many times to cover all the bags. On the contrary, that job is really hard and quite dangerous. Therefore, in this article, the author proposes a tool with two functions: wrapping bags and picking fruit at high altitude, to partly help farmers in caring for and harvesting agricultural products.

Wrap the product in bags and pick the fruit at high altitude (Figure 2). The structure and operating principles of this tool will be presented in detail in the next section.

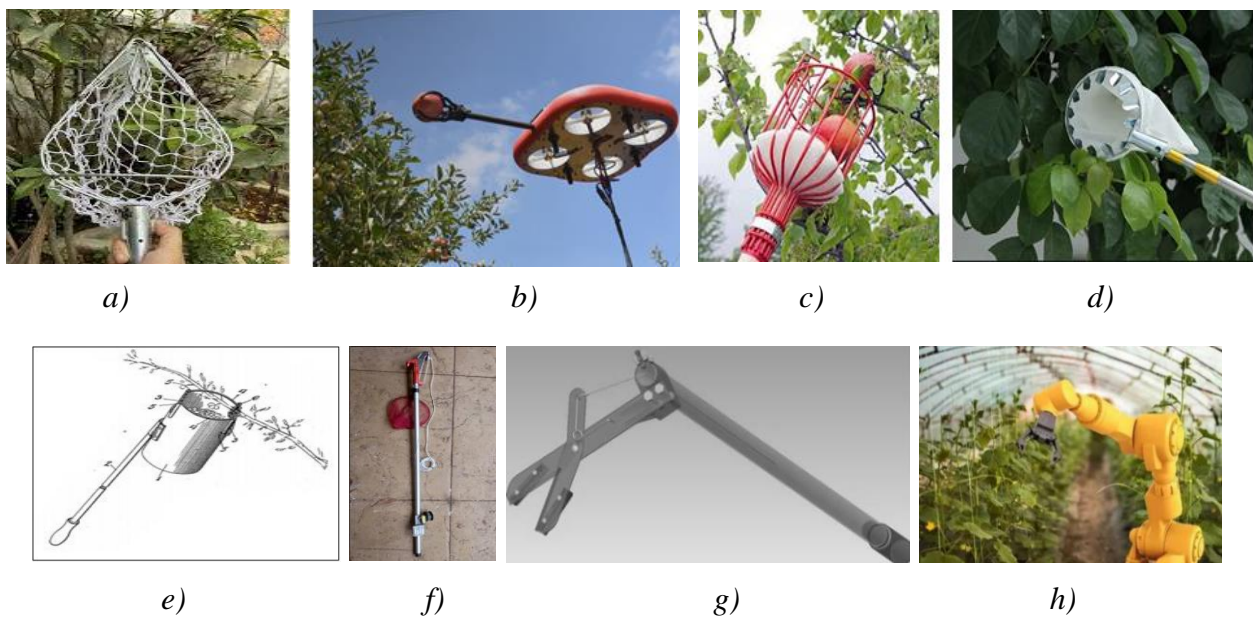


**Figure 2.** The tool for wrapping bags and picking fruits

## 2. Summary of some related research

### 2.1. The tool for picking fruits

There have been many studies on high-altitude fruit-picking tools. For example, fruit picking by robot (Baozeng Jia et al., 2009); strawberry picking robot (Andreas De Preter et al., 2018); pineapple picking robot (Nguyen Pham Thuc Anh et al., 2020); chili picking machine (Gentry et al., 1978); and apple picking robot (Kaixiang Zhang et al., 2021). Besides, there are also fruit-picking tools (Figure 3).



**Figure 3.** Some high-altitude fruit-picking tools

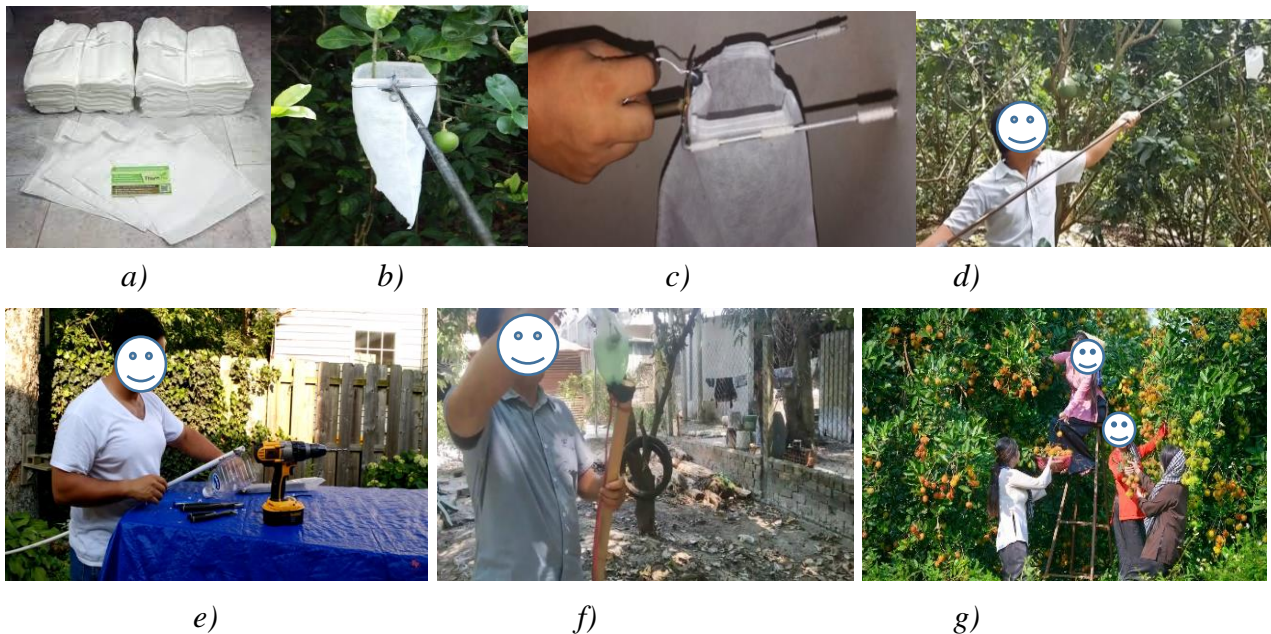
a, b, c, d) Some popular fruit picking tools today (Source: <https://tumuoado.com/dung-cu-hai-trai-cay/>)

e) Fruit picking tools (Muhammad Syafiq Izadi et al., 2020); f) Fruit picking tools (Lei Shi & Miao Dang, 2022); g) Fruit picking tools (Tian-Hu Liu et al., 2011); h) Robot cucumber picking (Van Henten et al., 2003).

## 2.2. The tool for wrapping bags of fruits

The operation of wrapping bags for fruit at high altitude is very complicated, including inserting the bag into the tool, bringing the bag to the correct position of the fruit that needs to be wrapped, and pulling the string to attach the bag to the fruit. We must be very careful when applying the bag to the fruit because, at that time, the fruit is still young, it is easy to scratch the fruit's skin if there is a strong impact, and it can easily fall off. Furthermore, the characteristic of fruit is that it grows randomly, with many different types of fruits, big and small, so people are currently confused. They have not researched any tools to automatically bag fruit with efficiency. They only know how to use some very rudimentary fruit bagging tools (Figure 4).

- Figure 4a, b, c and d are fabric bags and tools for covering fabric bags for fruit at high altitude. This product is advertised and sold online.
- Figure 4e, f, is a scene of a farmer making a tool to wrap bags for fruit at high altitude. There are several clips on the YouTube channel.
- Figure 4g is a scene of girls picking rambutans, using a ladder as a tool to climb up and move to pick fruit above. This photo is taken from an advertising photo of a frugarden in Can Tho.



**Figure 4.** Some tools for wrapping bags of fruits at high altitude

a, b, c, d) Fabric bags protect fruit. Source: <https://www.sendo.vn/100-tui-boc-trai-cay-loai-nho-oi-buoi-xoai-cam-19068531.html>; e, f) Farmers make their own tools to wrap plastic bags for fruit at high altitudes. Source: <https://www.youtube.com/watch?v=uTqODjIpySM&t=264s>; g) Advertising image of fruit the garden in Can Tho. Source: <https://www.chudu24.com/thongtindulich/2018/04/05/4-vuon-trai-cay-phai-ghe-khi-di-can-tho/>

## 3. Proposing a tool model with two functions: wrapping bags and picking fruits at high altitude

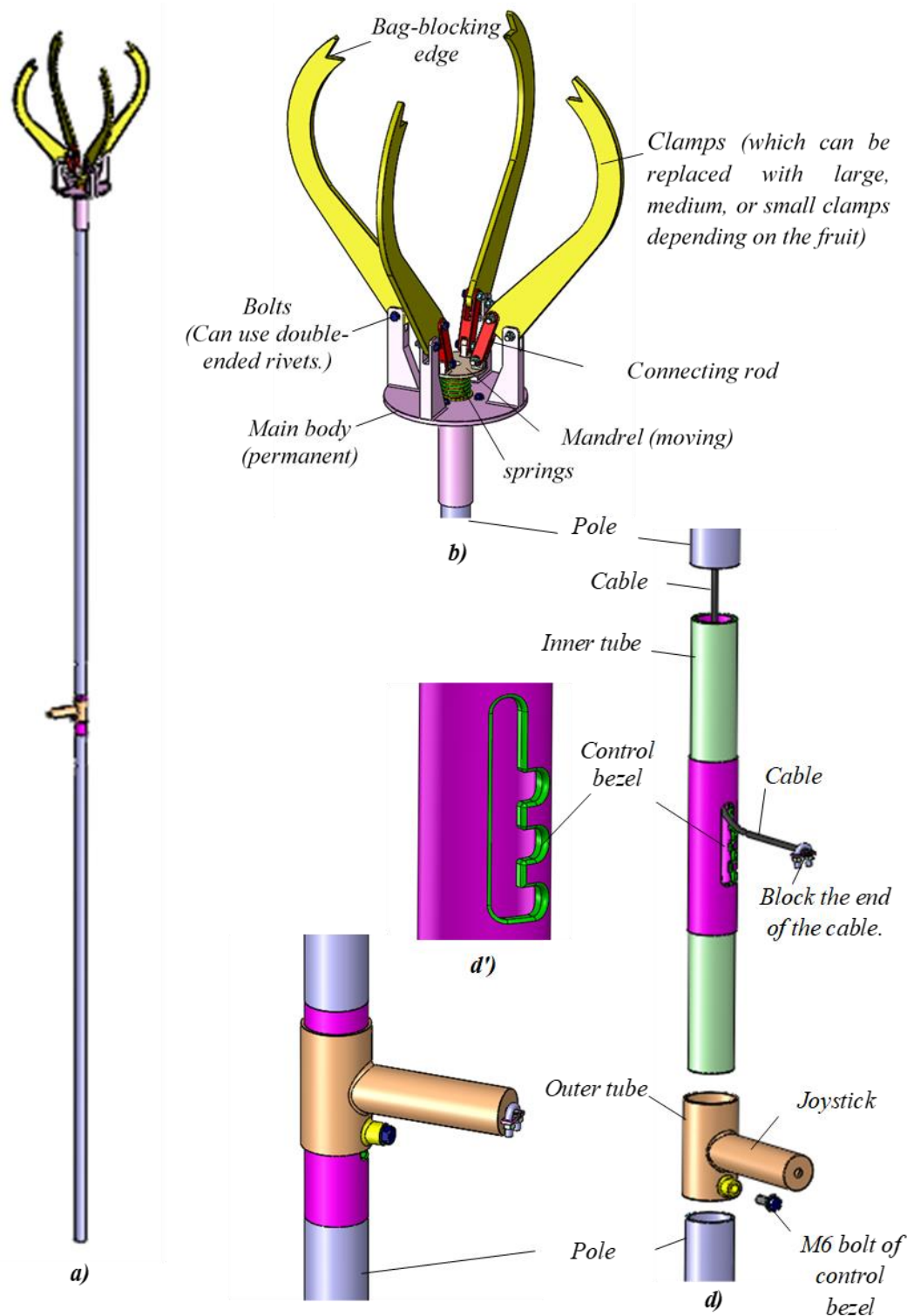
### 3.1. Structure

The author uses a 3-dimensional perspective to draw the overall image and set of the two-in-one tool (Figure 5). To fit the user's strength (it is convenient to lift up, lower down, and work for a long time without the user feeling tired), the author prioritizes the use of lightweight materials such as plastic, aluminum, wood, etc. Some heavy-duty parts (such as the main body and control lever, control bezel, etc.) must use steel materials. The clamps can be made in many sets of different sizes for backup when using bag covers (plastic bags or cloth bags) and picking different types of large and small fruits. For example, if we need to wrap a bag and pick mangoes, oranges, plums, guavas, avocados, etc., use small or medium clamps. When we need to wrap bags and pick large fruits such as jackfruit, durian, banana bunches, etc., use large and long clamps.



The important positions of this type of tool are the head (Figure 5b) and the control part (Figure 5c). If we have the conditions to produce quality goods, we will focus on producing those two parts. As for the pole, we can use stainless steel pipes (sold a lot on the market or bamboo bars, wooden bars, or hard plastic pipes that farmers have themselves).

Nowadays, 3D printing technology is widely known and applied by many businesses, so we can use that progress to print details for this product. Of course, we prioritize 3D printing with plastic materials to reduce the weight of the tool.



**Figure 5.** Tool structure with two functions: wrapping bags and picking fruit  
 a) Overall figure; b) Enlarged figure of the head; c) Enlarged figure of the control part  
 d) Decomposes the control part; d') Enlarge the figure to see the control edge of the inner tube.

This tool includes the following main parts:

- *Clamp*: there are four clamps; it is shaped like a human finger; it can be opened or clamped thanks to the spring and control cable. The upper ends of the clamps are cut at an angle of about 60 degrees (called the bag stopper). They are a place for users to squeeze the rim of the bag and then tie it with an elastic band. The tail of the clamp has holes for mounting bolts into the main body.
- *Control part*: consists of two interlocking steel pipes. The inner tube has cut grooves and control flanges. It is the intermediate part that connect the upper pole with the lower pole, creating a long handle for this product. Inside, there are cables connected from the head to the joystick. Cable outer diameter from 3 to 6mm. We use an M6 bolt (Figure 5d) to fit the flanges. When we install the control lever through the right-hand side, the M6 bolt tail fits into one of the three stop edges. From there, we have three states (maximum open, moderately open, and maximum closed) of the clamps.
- *Pole*: we can use 2 bamboo poles, each 1.5 to 2 meters long (with holes punched through the eyes to thread cables). However, it is best to use stainless steel handles available on the market (Figure 6).



**Figure 6.** Stainless steel pole

### 3.2. Operating principle

Normally, the spring is compressed and always tends to push up, causing the clamps to always open (Figure 5b). When we pull the control lever down through the cable, the intestine is pulled down, overcoming the spring force and pulling the connecting rods down, causing the clamps to slowly close. M6 bolts and stop edges help us control the different states of the clamps. Wrapping bags or picking fruit at high altitude depends entirely on the opening and closing of the clamps.

### 3.3. Design

This is a simple, safe, and cheap hand tool. The weight of the whole set is less than 3kg. When it works, the force acting on it is not large. The farmer can hold it, raise it up, and lower it down easily. Depending on the type of fruit, the clamp has different sizes and can withstand different forces. Here, the author pays special attention to working principles, structural rationality, materials, and manufacturing technology of details without paying attention to calculating the strength of the details. Because calculating the strength for each detail is not feasible, it cannot be applied to all different types of fruits, big, small, heavy, and light. Figure 7 is the preliminary design of some details of the tool for wrapping bags and picking fruits. The dimensions shown in the figure are for reference only. We can use 3D plastic printing technology to make these parts, or we can also make them from aluminum or steel.

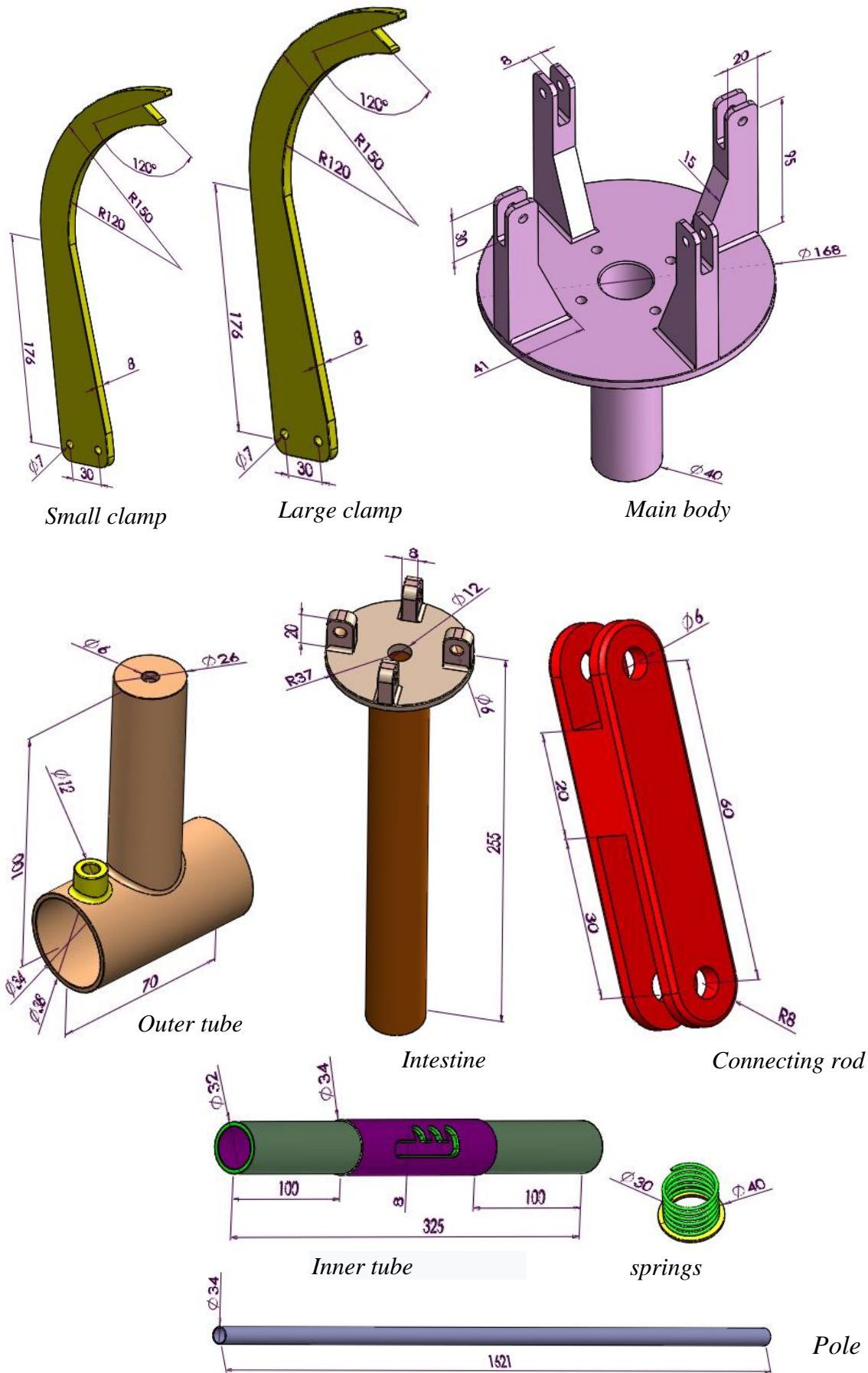


Figure 7. Preliminary design of some details of the tool for wrapping bags and picking fruits



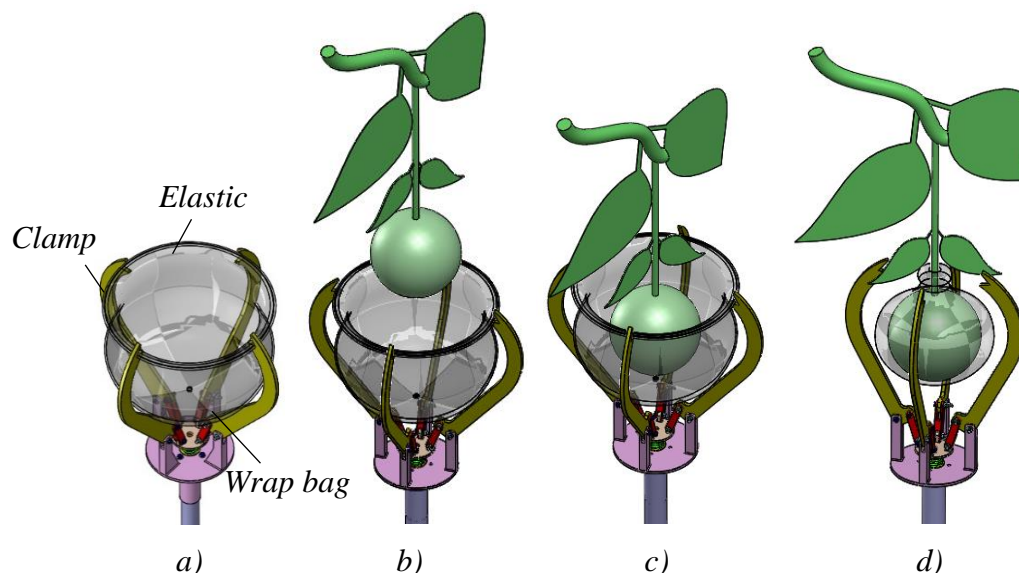
## 4. Instructions on how to use the tool for wrapping bags and picking fruits

### 4.1. When picking fruits at high altitude:

- Step 1: Push the control lever up a distance of about 15 mm to allow the four clamps to expand. Turn the control lever a small angle to the right so that the M6 bolt fits into the upper stopper. At that time, the open state of the four clamps is kept fixed.
- Step 2: Put four clamps to cover the fruit to be picked.
- Step 3: Turn the control lever to the left at a small angle so that the M6 bolt can escape the blocking edge. Next, pull the control lever down about 15mm and turn the control lever a small angle to the right to insert the M6 bolt into the lower flange joint. At that time, four clamps were clamped on the fruit that needed to be picked.
- Step 4: Spin the tool to try to twist the fruit's stem. As a result, the fruit is picked safely.

### 4.2. When wrapping bags of fruits at high altitude:

The author describes this part in Figure 8. We also control the clamps of the clamps to open and close as described above. For the rest, the author notes the figure.



**Figure 8.** Steps for wrapping bags of fruits at high altitude

a) Attach the bag to the clamp; use elastic to hold the mouth of the bag tightly at the four edges of the four clamps; b) Insert the whole set (clamp and bag) under the fruit we want to wrap; c) Put the whole set (clamp and bag) over the fruit we want to wrap; d) Control the clamp to close; the elastic thread slides off the edges of the four clamps, making the bag cover the fruit.

The author looked up a lot of information on the Internet, researched the market, and interviewed farmers, but still could not find any official research on bagging tools for fruit at high altitude. It is very difficult to calculate, design, and manufacture a tool that can cover a variety of fruits, reducing hand time, but at an acceptable price for farmers. According to the author, there is currently no smart fruit bag wrapping tool for the following reasons:

- Fruits come in a variety of shapes and sizes, making the wrapping process more complicated than wrapping other items. Automating this process can be difficult.
- Fruits grow very randomly, weaving in and out of branches and leaves, so finding them and wrapping them gently in bags, not letting them fall, not damaging other fruits, etc. is difficult for machines to do.
- The job of wrapping fruit bags has only been applied to people recently. That was the time when people began to produce clean fruit, limiting pesticide spraying. Therefore, perhaps there hasn't been enough time for scientists to think about bagging tools for fruit.

## 5. Conclusion

The author briefly presented fruit-picking tools and insect-proof bags and related research on them.

Next, the author provided a design drawing, along with descriptions and instructions for use, of a tool that has both functions: wrapping bags and picking fruits at high altitude. The author uses 3D images, ensuring everyone can understand and apply.

This tool is simple and cheap, but it has many benefits for farmers. Farmers do not have to use ladders to climb high when wrapping bags or picking fruit from high places. The author is trying to make and test this device. It certainly has some limitations, and the author will overcome those limitations in subsequent studies.

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