

# HARVESTING POLE (ZIRAFAH)

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**E**fficient harvesting of fresh fruit bunches (FFB) plays a vital role towards improving the quality of harvested FFB. Harvesting of short palms (<3-metres in height) is a relatively simple operation.

A chisel attached to a short steel pole is normally used. However, harvesting of tall palms (> 3-metres in height) requires a different method and technique. A sickle attached to a long pole is normally used. Three activities have to be carried out: lifting the pole upright, cutting fronds and fruit bunches. These activities require high skill and energy. A person who does these jobs should have a good skill in handling the tool and enough energy to carry out the cutting operation.

Before aluminium poles were introduced, bamboo was the most popular harvesting pole. However, a lot of problems have arisen using this pole. These include difficulty in getting supply and the desired length, and the heavy weight. Harvesting productivity was also very low. Realizing this, an effort was started to develop an improved pole to replace the bamboo pole with the main aim of improving productivity of workers.

## DESIGN CONCEPT

Several criteria were considered in the design of the new pole. The pole must be light in weight, lower in lifting moment, higher in stiffness, comfortable to human hand, and telescopic for ease of height adjustment and transportation.

To fulfill these requirements, the design parameters have been focused on the cross-sectional shapes, dimensions (diameter, thickness

and length) and the combinations of length. Other parameters such as material composition and method of fabrication were also taken into consideration. The oval shape was chosen because it provides a higher surface area for better hand gripping and also exhibits higher stiffness to prevent the pole from buckling. Poles with two different diameters were fabricated, namely basic and extension poles by which the extension pole will be slid into the basic pole. The diameters of the poles are 45mm\* x 35mm\*\* and 39.5mm\* x 29.5mm\*\* for basic and extension poles, respectively. The thickness of the poles is 1.3mm. Figure 1 shows the cross-sectional shape of the Zirafah.

(Note: \*-major axis, \*\*-minor axis)



Figure 1.

## PROTOTYPE DEVELOPMENT

Aluminium alloy was chosen as a base material for developing the prototype as it offers the desired characteristics as proven in aircraft application. This alloy has a better strength and longer life span. Two sizes of poles were developed, *viz.* basic pole (the biggest diameter), and

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extension pole (smallest diameter). The standard lengths of the poles are 3-metres, 6-metres and 9-metres. The method of joining the poles is by sliding the smaller pole into the bigger pole. An U-clamp is used to clamp the poles firmly when the desired length is obtained.

A physical test was carried out on the 6m + 9m pole to determine the weight, deflection, and the point of centre of gravity from the base of the pole. Results showed that the weight, deflection and point of centre of gravity of the pole were 7kg, 1.09cm and 6.97m.

### FIELD TRIALS

Field trials were carried out in a number of commercial plantations to assess its performance in terms of productivity and durability. From these field trials, it was found that the

design was acceptable to the harvesters with respect to pole's diameter, flexibility and weight. Harvesting productivity ranged from 100 to 200 bunches/man-day, which is about 50 to 100% more as compared to bamboo poles. However, the productivity depends very much on the cropping level, field topography and the harvester's skill. It was observed that the pole can last for about six to 12 months depending on the method of usage. The results of the trial over a one year period in six estates are shown in *Table 1*.

### CONCLUSION

The use of Zirafah increases the efficiency of the harvesting operation. Palms that could not be harvested before can now be harvested. Workers can harvest more fruits, thus increasing their daily earning. As the pole is light, the complaint of back strain from the workers has been reduced. Its telescopic feature enables the workers to harvest palms of different height.

**TABLE 1. AVERAGE DAILY PRODUCTIVITY OF THE ZIRAFAH**

Estate	Productivity (FFB/man-day)
A	127
B	117
C	157
D	107
E	209
F	162
Average	146

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