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A REVIEW ON FARM MECHANIZATION AND ANALYSIS ASPECT FOR *DIOSCOREA HISPIDA*

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Abstract- *Dioscoreae hispida* which entitle *Ubi gadong* in Malaysia is a poisonous plant where methodical studies have shown that its rhizome contains toxic poison. It can only be consumed after the poison of *dioscorin* is removed. From the farm mechanization aspect and design review, the condition of soil, the characteristic shape and size of the "*Ubi gadong*" will be measure. The material selection and acting force are require aspect in the designing, modeling and simulation stage of a handheld harvester which to produce a light and powerful hand tool harvester for application in wildlife forest. The semi automated machine is reviewed and the operation for planting, weeding and harvesting will envelop full operation of *Ubi gadong* mechanization. Conceptually, the result from modeling will be used to determine the stress, displacement and strain force during design and modification process. During the fabrication stage, welding, grinding and use of workshop machine may be required.

Introduction

Dioscoreae hispida (D.H) is one of the *Discorea spp* (Yam) species and characterize as a climbing plants with glaborous leaves and twining stems, which helix readily around take. Asiatic Bitter Yam (*Dioscoreae hispida*) is one of the most economically important yam species, which serves as a fasten food for a millions of people in tropical and subtropical countries (Hahn, 1995; Udensi. 2008) and was classified as a wild creeping and climbing plant which can grow up to 20 meters in height. D.H is commonly found in secondary forest and grow under shaded areas or near streams which is known by the local or vernacular names such as *Ubi gadong* (Nashriyah et al., 2010). Figure 1 show the Tuber of *Ubi gadung*.

Farm Mechanization Aspect

Mechanization is a concept and cannot be measured directly. Appropriate indicators must be selected to determine levels of mechanization like variable that allow describing and monitoring the processes (Wan Ishak, 2010). States and tendencies of system at the farm, regional, national and worldwide level (Morteza et al., 2010).

As stated in righteous book, Al-Quran in sura Yassin verse 82, Allah SWT just ask when intend something. The flow for construction of the design, we need to design, model before start on fabrication stage. (Sarah, 2008) stated that before construct final product including the preliminary design, schematic design and son on. Figure 2 show the flow of construction design. It shown that the numbers of document was significantly growth and was reassessed on at every stage of process.

To design and model the handheld harvester for *Ubi gadong*, the criteria of the land character, size and weight need to be consider (Hudzari, 2010). The product will need light enough for easily carrying during track on the jungle. The material to be selected must fulfill the desire output of the product. Davoodi et al., (2010) stated the composite material had some advantages during design and fabrication stage. It it due to desired properties can choose and design to suit with the final product.

Conceptual Design for Innovative Hand Tool Harvester

In Malaysia, the farmer would normally harvest the *Ubi gadong* by using a hand hoe. The farmer needs to plow on around the stem a bit larger than the fruit. Sometimes the farmer may need to cut the root of the fruit and by using a hand hoe; he needs to push the ubi from the outside of the tree. This process might need to be repeated a few times before the ubi could be harvested. It consists of a designed bar with a foot press ladder. Figure 3 shows the design schematic drawn using solid modeling software. It has a T-shaped handle connected to a stepping bar then a fork. The use of a fork is for penetrating the soil easily yet reducing resistance when pushing the harvest out. A large stepping bar gives more power to push and penetrate the fork into the ground and also acts as a fulcrum. The hand hold will designed as to make the user easily pull up the tuber without move the body. Similar designed was fabricated by Mohd Solah et al., (2009); the loose fruit picker with bend hand holder make reduced the back pain of the worker during collection oil palm fruits. The worm and worm gear also can apply which then later; the user will just need to rotate the drive gear for penetrating the rod bar deeply into soil while other side gear will grab the *Ubi gadong* tuber of. Figure 4 shows the current development of hand tool designed for harvesting the *Ubi gadong* manually.

The innovative hand tool also was developed by the Agricultural Mechanization Development programmed, Philippines for *Cassava* (*Manihot esculenta*) or ubi kayu (FAO, 2011). It is used the crane which is positioning the blade under the plant's base, holding the stem of the root with the twice jaw and using the pedal action of this tool to draw up the deposit. To facilitate this kind of operation it is useful the lifter, the cassava is attached by means of a chain mounted to one end of the lifter while to the other end there is a handle to pull up the plant. The ubi kayu was plant similarly with ubi gadung. Its tuber normally growth at the surface of soil. But the root for ubi kayu is hard and big compared with ubi gadung. This criteria need to overlook during designing for the innovative tool harvesting.

Conceptual Design of Semi Automated Machine

The mechanism produced in handheld harvester design will later be use for integration in development of semi-automated machine. This machine will operate on both side of planting and harvesting stage. The kubota tractor available at Universiti Sultan Zainal Abidin, UniSZA Malaysia will use as traction device. The implement will buy from outside country which already success in harvesting like potato harvesting machine. The semi automated machine also was developed for harvesting the *Ubi kayu*. The harvester is composed of two parts: a digger to pull the roots out from the soil and a conveyor belt that brings the cassava from its stem and carries it into a container. The semi auto machine for cassava harvesting in Malaysia as shown in figure 5 also was reported by Md. Akhir and Sukra (2010). The digger part will penetrate the soil and push up the cassava while the rotating blade and conveyor will isolate the fruit with soil.

Simulation Analysis for Designed Product

The concept of mechanization in agriculture of *Ubi gadung*, the solid modeling software etc, CATIA or SOLIDWORKS can introduce for designing and simulation stage. Figure 6 shows the initial result of simulation model for stress force during harvesting process. As in figure 6, the stress point shown as at the joint which indicated as A. This point are should modified to enhance the strength such as welding with reinforced bar. Simulation program is very useful on designing stage before get the correct fabrication and efficiency of the final product (Sapuan et al, 2007). This analysis application is necessary to simulate the practicality and workability of the conceptual design of handheld harvester or machine before start on final fabrication stage. The engineering concept will applied which is at first is extraction of the design layout of the machine, then schematic and wireframe of the model, modification in computer aided design (CAD) environment, simulation and last is the complete drawing for fabrication purpose (Darius and Azmi, 2003).

Conclusion

The advancement of technology should introduce in most important area; agriculture, as for benefit of mankind. The solid modeling software is useful for design, model and simulate the workability of the designed equipment in CAD environment system. The simulation program embedded in solid modeling software helpful for designing and modeling stage. The simulation analysis will make the designer choose the best decision for fabrication stage. The farm mechanization for *Ubi gadong* is help to produce the good quality and output in this new exploration of wildlife food for commercialization.

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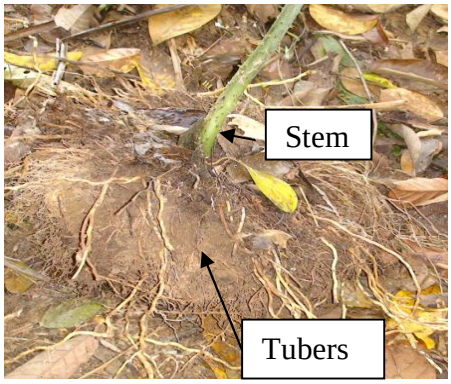

Fig. 1- The tuber and stem for *Ubi gadong*

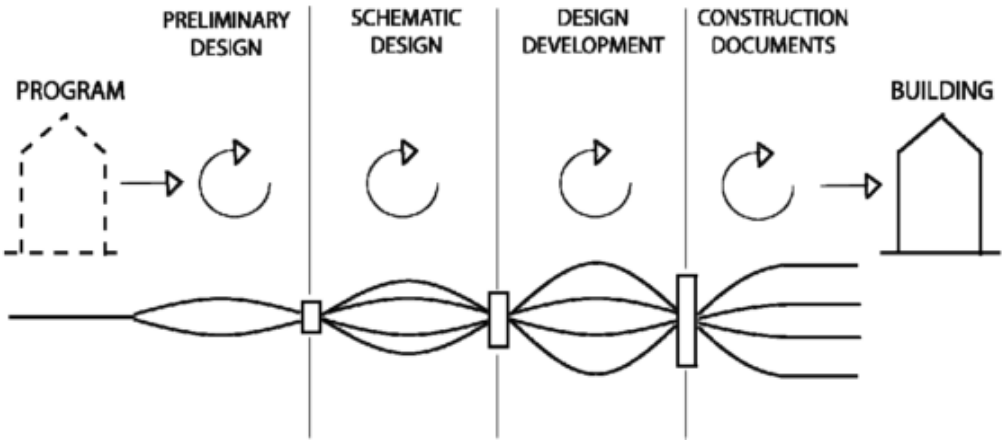

Fig. 2-Flow chart process for designing and fabrication level.

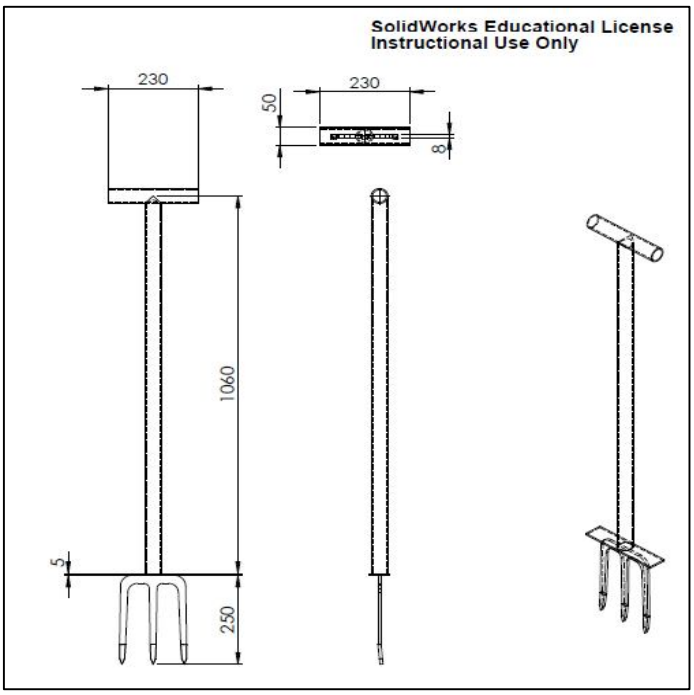

Fig. 3- Conceptual design of hand tool harvester (measurement unit millimeters)

Fig. 4- Penetrating the hand tool near *Ubi gadong* plant

Fig. 5- Semi auto machine for cassava harvesting developed in Malaysia

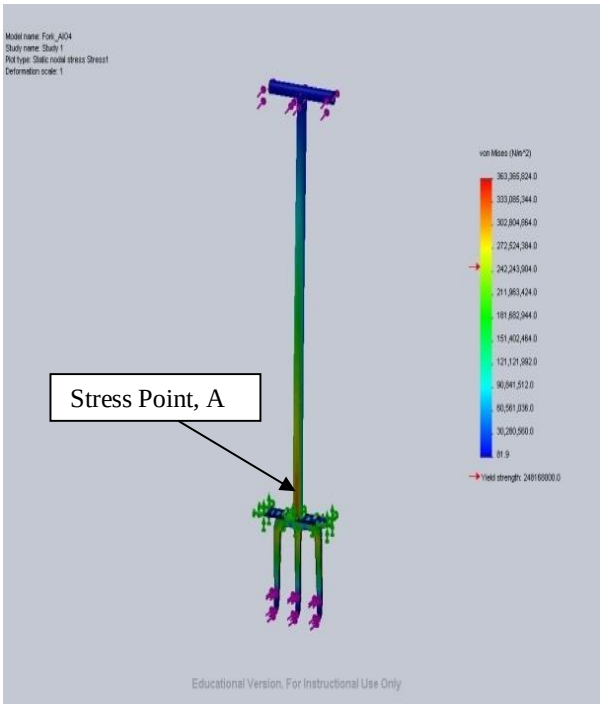

Fig. 6- Stress determined by looking at display image in color rule