

Investment Feasibility of Jackfruit Dodol Stirrer Machine for the Household Industry

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Abstract – Fruit *dodol* is a characteristic Lombok snack. The process of making *dodol* requires quite a lot of physical effort and causes fatigue when stirring the dough. This is done so that the *dodol* is cooked perfectly. To overcome this, an automatic *dodol* mixer was applied that uses a motor for the stirring process. The results of the investment-worthy analysis show that the payback period of investment or PBP (payback period) of the stirring equipment is 0.369 years or 4.428 months. Home industry enjoyed the benefits of the investment cost of the stirring equipment after 3.267 months. This stirring equipment is more effective because the mixing results are more even and does not cause scale in the container.

Keywords – Investment Feasibility, Jackfruit Dodol, Stirrer, Household Industry.

I. INTRODUCTION

Dodol is a traditional snack that is quite popular in the community. Fruit *dodol* is a characteristic Lombok commodity that comes from the processing of agricultural products. This commodity is mostly done by home industries spread across the island of Lombok. The raw material used is jackfruit which thrives in the area. Household industries are unable to produce fruit lunkhead in large quantities using manual tools. This commodity is mostly done by home industries that are scattered in the Lombok island region.

Based on the results of surveys and interviews with several small industries in the Suranadi area of West Lombok, it was found that production conditions were limited and partner industries were not able to produce large quantities. In addition, the *dodol*-making process requires considerable physical energy and causes fatigue, especially when stirring the dough. This is done so that the *dodol* is cooked perfectly. Making lunkhead, which is mainly done in the heating process until it thickens, is still done manually. This requires a continuous stirring process and takes a long time, namely $\pm$

3 hours. Heating requires a large amount of physical energy and is a tough work. Lack of heating can cause the *dodol* product to suffer a rancid odor. Heating must be controlled because it affects the water content in lunkhead. The water content of 20.38-30.61% in *dodol* provides durability for ± 2 weeks [1]. Work in *dodol* stirring as shown in Figure 1 causes fatigue faster and higher workload [2].

Household-scale *dodol* producers generally have not standardized the heating process during *dodol* processing. The making of *dodol* uses traditional tools such as a wood-fired stove and the stirrer is *sutil*. Work tools like this will affect how to work, namely fatigue quickly. This has an impact on slower body movement which has an effect on the resulting *dodol* which still contains a lot of dirt, smells burnt, the water content is still high so that the *dodol* is less durable [1]. To overcome this, an automatic *dodol* stirrer was applied. The automatic *dodol* stirrer uses a motor to drive the stirring.



Figure 1 Work posture stirring lunkhead [3]

Investment feasible analysis aims to determine the possibility of profitability obtained by both companies and workers in the short and long term. In addition, this analysis is carried out to determine the level of benefit from investment. To determine the investment feasibility (economic aspect) of fruit *dodol*, an analysis was carried out based on the Payback Period (PBP), Break Even Point (BEP), and Return on Investment (ROI) methods. BEP is a point or condition that a company does not gain and does not suffer losses [4]. *Return on Investment (ROI) is the profit obtained from a certain amount of capital.* This value can be used to determine the efficiency of using capital. ROI is the company's ability to generate profits that will be used to cover the investment issued. This ratio relates the profit obtained from the company's operations (net operating income) with the amount of investment or assets used to generate operating profits.

This study analyzes economically the income from a household scale *dodol* fruit business based on the profits from the investment in the automatic stirring machine. Economic analysis is conducted to determine the level of benefit from investment. This is done based on the Payback Period (PBP), Break Even Point (BEP), and Return on Investment (ROI) method of using an automatic *dodol* stirring.

II. MATERIALS AND METHODS

This study uses agricultural products in the form of jackfruit as raw material. The working tool is an automatic *dodol* stirring. The agricultural product is in the form of fruit lunkhead because *dodol* is a characteristic Lombok commodity that comes from the processing of agricultural products. This commodity is mostly done by home industries spread across the island of Lombok. To reduce fatigue and high workloads and improve the quality of the resulting product, the *dodol* stirring process is manually replaced by using an automatic stirrer.

Payback Period (PBP) analysis is performed to determine the length of time the investment can be returned when a Break Even Point (BEP) occurs. According to Giatman [5], the Payback Period is calculated based on Equation 1.

$$k_{(PBP)} = \frac{\text{Investment}}{\text{Annual Benefit}} (\text{year}) \quad (1)$$

Annual Benefit (IDR/year) is income – operating expenses; K (PBP) is the number of payback periods; and n is the investment period. To determine whether an investment plan is economically feasible or not, a certain size or criteria is needed, so that the investment plan is said to be feasible if $k \leq n$.

BEP aims to calculate the volume of *dodol* production from the use of an automatic *dodol* stirrer that causes workers to neither gain nor suffer losses. BEP is a comparison of total revenue from sales of production at PBP with the selling price per kg of *dodol*. According to Pujawan [6] in the break even analysis it is always assumed that the total revenue is obtained from the sale of all products produced.

$$TR = pX \quad (2)$$

The break-even point will be obtained if the total costs involved are *exactly* the same as the total income.

$$TR = TC \quad (3)$$

$$BEP = \frac{FC}{p-V} \quad (4)$$

TR is the total revenue from the sale of X products; FC is a fixed fee; p is the selling price per unit of product; VC is the variable cost of making X the product; TC is the total cost of making X products; X is the *volume* of production that causes the company to break even (BEP). Profits are obtained if you can produce above X (exceeding the break-even point).

Return on Investment (ROI) is calculated based on the sale of *dodol* when PBP is reduced *by* investment compared

to investment. The profit used to measure this ratio is net income. Return on Investment (ROI) can be formulated as follows.

$$\text{ROI} = \frac{\text{Sales Total} - \text{Investment}}{\text{Investment}} \times 100\% \quad (5)$$

III. RESULTS AND DISCUSSIONS

The use of a stirrer machine in the manufacture of fruit lunkhead has an impact on workers in the process of stirring the lunkhead to become lighter. This is related to a change in the manual work method shown in Figure 1 to use an automatic stirrer. This is in accordance with the research of Santosa [3] that changing the manual dodol stirrer reduces worker fatigue by 22.09%. Engineering techniques performed on work tools reduce the workload and musculoskeletal complaints, respectively 14.57% and 27.02% [7].

The process fruit *dodol* of stirring is still conventional, as shown in Figure 1 and is carried out in the open. It is susceptible to contamination of dust and other impurities (less hygienic). To replace this process, an automatic stirring machine of gas-fired is used.

The fruit *dodol* before the drying process is first carried out by the heating process until it thickens. In the heating process, *constant* stirring is required. This stirring process takes quite a long time, namely ± 3 hours. This process requires a large amount of physical energy, causes fatigue, especially when mixing the dough, and is a tough process. Lack of heating can cause the dodol product to suffer a rancid odor. Heating must be controlled because it affects the water content in lunkhead. Based on this, an automatic *dodol* stirrer is used as shown in Figure 2.



Figure 2 Fruit lunkhead stirrer machine

The use of a stirrer machine has an impact on the absence of scale on the pan and the product does not burnt. This is because the work of the tool uses *the* principle of indirect heating. The mixing pan does not come into contact with the heat source. The heat source is first used to heat the water in the outer tube. The heat transfer from the water occurs to the inner tube and is used as a heat source for *dodol* stirring. The mixer uses two tubes, namely the outer tube as a place to heat water which is directly connected to the heating source. While the inner tube is used to stirring the *dodol*. The

principle follows the conduction heat transfer with the annulus tube type.

In general, the process of making fruit *dodol* includes choosing ripe *and* not rotten fruit; steaming the pulp for 5-10 minutes; blend fruit to make it smooth and add sugar, vanilla, salt to taste; heating the mixture and stirring the dough so that it does not burn; heating is stopped when the dough has become a chewy, brown, oily paste; the dough is dried early ± 2 days; the dough is molded on a baking sheet with a thickness of ± 2 cm; the dough is dried continued for ± 2 days; the dough is cut into small pieces to size; dodol pieces are

dried at the end of ± 1 day; *dodol* ready to pack. The use of a stirring machine for making fruit lunkhead has a good impact on workers. It is experienced by workers that the work is lighter in the process of stirring *dodol*. The final result of the *dodol* dough has an impact on the production results more because there is no crust that sticks to the pan. In addition, it tastes better because there is no longer a mixture that is burnt or bitter because it is mixed with the ashes from the wood burning.

Investment analysis is carried out based on data for one month. The investment life of the biomass dryer and *dodol* mixer (n) is assumed to be 7 years. These assumptions are based on general measures to *determine* the age of the investment. The general measure for determining the age of investment is the same as the time period which is approximately equal to the economic life of the project [8]. The investment for a *dodol* stirring machine with a capacity of 10 kg is IDR 10,000,000. The calculation of income in one month is adjusted to the effective workday performed by household industry, which is 4 days in one week. Income of IDR 120,000/kg x 5 kg/day x 4 days/week x 4 weeks/month is IDR 9,600,000/month.

Operational costs (one business or worker) for a one-time production process include raw materials, wages, and other expenses. The raw materials include Jackfruit 6 kg x IDR 15,000 is IDR 90,000; sugar 2 kg x IDR 12,000 is IDR 24,000; gas fuel (LPG) IDR 15,500; and electricity 3 hours x 1,400 kWh of IDR 4,200. The total raw material for one production process is IDR 133,700 and wages and other expenses of IDR 325,000/day. So that the operational cost in one month is IDR 458,700/day x 4 days/week x 4 weeks/month is IDR 7,339,200/month.

Profits in 1 month (one business or worker) are income - operational costs, amounting to 9,600,000 - 7,339,200 = 2,260,800 (in IDR). While *the* annual benefit (annual profit before deducting investment) is IDR 27,129,600. The calculation of the payback period (PBP) using equation 1 is IDR 10,000,000: IDR 27,129,600 = 0.369 years. Based on the payback period analysis, the payback period for investment costs is 0.369 years or 4.428 months. This means $k < n$ (0.369 years < 7 years), so it can be stated that the investment in the *dodol* stirring machine for the fruit *dodol* making business is feasible.

To get an obtain for household industry who make fruit *dodol* in their operations do not get profit and do not suffer losses, an analysis is carried out based on the break even point (BEP). The total income from the sale of all products produced for 4,428 months (according to PBP time) is IDR 120,000/kg x 5 kg/day x 4 days/week x 4 weeks/month x 4,428 months = IDR 42,508,800. *p* is the selling price of the product unit, in this case based on the selling price of the lunkhead product, which is IDR 120,000/kg. Production volume (X) = $\frac{\text{IDR } 42,508,800}{\text{IDR } 120,000/\text{kg}} = 354.24 \text{ kg}$. The production of fruit lunkhead using an automatic stirring machine that causes it to be at the break even point is when the production volume reaches 354.24 kg.

Return on investment (ROI) returns is expressed as a percentage. This percentage shows the return on investment that may be obtained in a certain period of time as a result of repairing work tools. The specified *time* period is the period of return on investment costs in the payback period analysis. Total sales are IDR 120,000/kg x 5 kg/day x 4 days/week x 4 weeks/month x 4,428 months = IDR 42,508,800 with an investment of IDR 10,000,000. With using an automatic stirrer machine, the ROI is calculated based on total sales - investment divided by investment times 100%. So that the ROI rate is 325.088%. The relationship between the investment in the automatic stirrer machine and the profits earned by the household business of making fruit lunkhead is shown in Figure 3.

The payback period of investment cost or PBP (payback period) of the automatic stirrer machine is 0.369 years or 4.428 months. The *income* of household industry for 4,428 months is IDR 42,508,800; operational cost Rp 32,497,978; and an investment of IDR 10,000,000. At 4,428 months, workers do not experience losses or gain no benefits. Workers can enjoy the benefits of the automatic stirrer machine investment costs after 4,428 months. The application of the automatic stirrer machine in the fruit *dodol* business has an ROI rate of 325.088%. It can be said that the application of an automatic stirrer machine the *dodol* of fruit in the household industry provides positive results in the form of economic benefits and increased work comfort for workers.

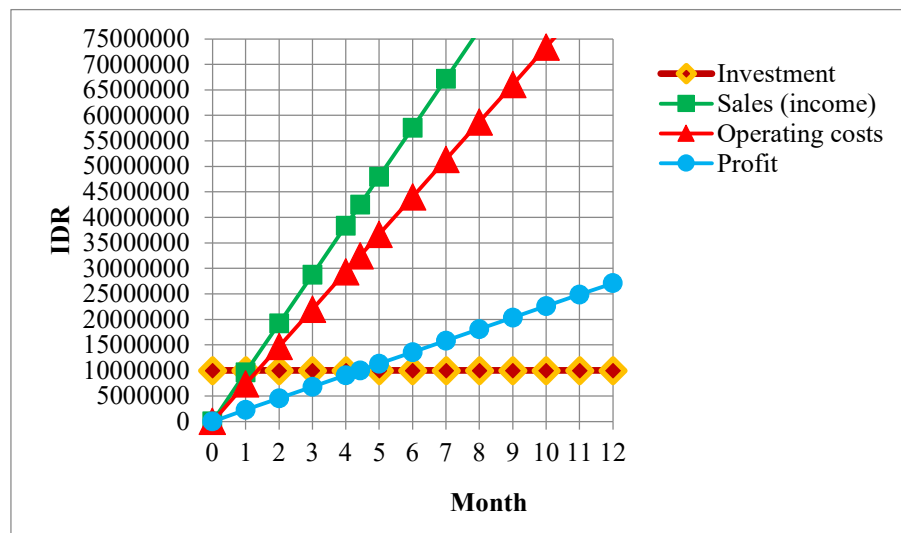


Figure 3 The relationship between investment and profit in the process of making fruit dodol using an automatic stirrer

IV. CONCLUSIONS

Based on the results of research and analysis, when compared with the manual stirring method, it can be concluded that the automatic *stirrer* machine in the fruit dodol household industry has a good impact on workers. This is based on information from workers that they feel lighter in the dodol stirring process. Household industry can benefit from the investment costs of the automatic stirrer machine after 4,428 months. The final result of the *dodol* dough after stirring using an automatic stirrer machine is more effective because the stirring results are more even and there is no crust in the pan.

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