Application of an Integrated Cooking Pan in Sambal Production

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Application of an Integrated Cooking Pan in Sambal Production

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Abstract. Sambal is one of the complementary foods that a favourite of many people. Sambal Sedep Oma (SSO) is one of the small medium enterprises (SMEs) that produces sambal in Semarang which becomes a partner for the community service program of Regional Excellent Product Development Program (Program Pengembangan Produk Unggulan Daerah PPPUD) funded by the DRPM RISTEKDIKTI. So far, SSO has produced various flavours of sambal such as sere sambal, onion sambal, smoked fish sambal, and salted fish sambal. All SSO products already have homemade food numbers (Pangan Industri Rumah Tangga, PIRT) and certified with halal. Hence, SSO has the potency to expand the marketing area and increase its capacity. However, this SME potency has an obstacle in the cooking process that takes a time for the production. It takes about 2 h cooking process with continuous stirring to avoid inhomogeneity and overcooked sambal in some spots. Moreover, the use of a shallow wide cooking pan makes the stirring process is difficult for large capacity. The team of PPPUD proposed to use a deep-cooking pan which integrated with motored stirring. This cooking tool consists of a stove, a deep cooking pan and stirrer equipped with a motor. The evaluation showed that the application of this equipment insignificant in reducing the cooking time but help in maintaining the consistency of the product quality. Although reducing 2.85% of profit per batch production, application this equipment has successfully reduced the number of involved workers in the sambal production.

1. Introduction

Sambal is one of the traditional chilli sauce complementary foods that a favorite of many people. SNI 01-2976-2006 [1] and SNI 01-4865.1-1998 [2] defines this chilli sauce as a thick sauce mainly made from chilli prepared by additional seasonings with or without the supplementary allowable stuff. Many types of sambals and sambal base food products develop seemingly endless in the community. Some sambals previously are cooked before serving, others are made of uncooked ingredients. Although some sambals mildly flavoured but the majority of sambals are very hot and spicy [3].

Some Small Medium Enterprises (SMEs) focus on producing packed sambal with various supplementary stuffs, others produce sambal for complementing of other food products such as in

pressed milkfish and crusted chicken production. One of the SMEs that produce sambal in Semarang is Sambal Sedep Oma (SSO) which is a partner of the community service program by University of Diponegoro under Program Pengembangan Produk Unggulan Daerah (PPPUD, Regional Excellent Product Development Program) funded by the RISTEKDIKTI.

SSO has produced many homemade sambal variants such as lemongrass sambal, garlic sambal, smoked fish sambal, and anchovy sambal (Figure 1) using natural preservation. SSO sambal products mainly are packaged as a 140 g plastic pot with production capacity ranges 55-60 pots per batch. All SSO products already have PIRT numbers and halal certification. These legal registrations support SSO products to potentially expand their distribution into a wider market area. However, increasing capacity per batch of production become a challenging for the SMEs due to their limited equipment capacity.

Figure 1. Some variant of SSO products

There are 3 main stages in the process of sambal production *i.e* raw material preparation, cooking and packaging [4]. The process of preparing raw materials involves washing process, saute of the chillies and other ingredients including the stuff preparation. The chillies and other ingredients are then ground in a separate process. In this grounding process, the size of the chillies is minimized but not crushed until smooth so that the texture of the chilli can still be felt when consumed. Whereas other ingredients such as shallot and garlic, crushed separately from the chillies and desired to be crushed smoothly. The next stage of making sambal is a challenging cooking process which takes up to 2h-continuous stirring to maintain homogeneity and avoid over burning product. SME is still using a big household frying pan for the cooking process with manpower stirring. Fewer problems are found in the cooking process for small capacity production but it becomes a significant one for large capacity production. Base on this problems, this work was proposed to improve the equipment for the sambal cooking process.

2. Method

SSO and the PPPUD team discussed to find the best solution out of many possible ones. Some conditions required to take into account in finding the right solution, including the availability of SME infrastructure, the ability of SME human resources, the funding from RISTEKDIKTI and SME partner, and the period of this work. The scheme activity in solving the problems is presented in Figure 2. The team proposed to design an integrated cooking pan with a motor-stirrer for a capacity of 6 kg of chili. The appliance was equipped with a motor for continuous stirring and gas stove. All these tools were set in a metal supporting frame. The integrated design of the proposed appliance is described in Figure 3.

This cooking equipment consists of a stove, frying pan, stirrer, axle, stirring motor and support frame. The pan, stirrer and axles are made of stainless steel since these tools directly in contact with the sambal ingredients. Meanwhile, the 70x70x80 cm of the frame is made from an iron bar. The pan is designed

for a deep fried cooking to avoid the ingredients splash out during the cooking process. The pan base diameter is 40 cm with 35 cm of the height. One side of the top edge is curve shaped to facilitate in pouring out the cooked sambal. The single blade stirrer is connected to the motor by the axle. This axle is also made of stainless steel with a length of 70 cm. The motor is run using electricity and the gas stove is used LPG for the fuel. The impact of this equipment was evaluated after the equipment application.

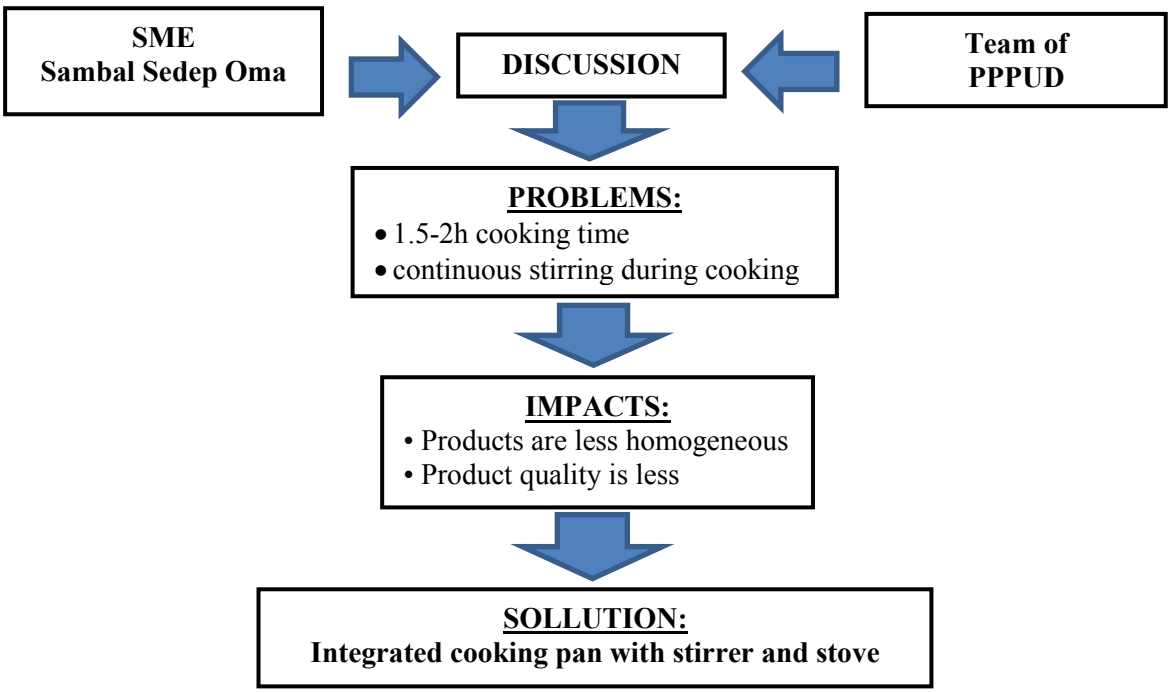

Figure 2. Scheme activity in solving the SME problem

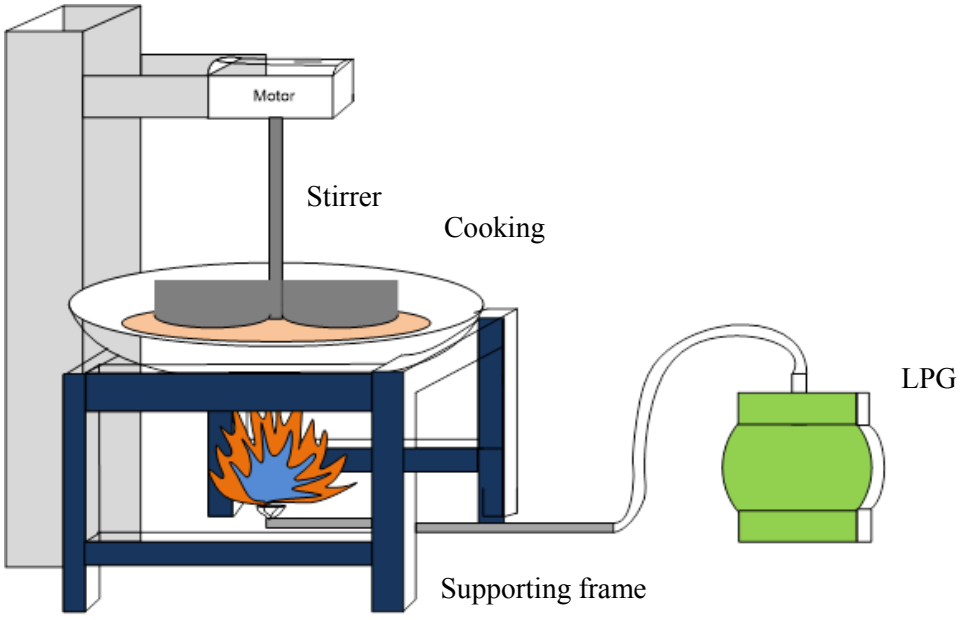

Figure 3. Design of the proposed equipment

Figure 4. The cooking equipment before (left) and after (right) PPPUD companion process

3. Results and Discussion

The output of this activity is a set of an integrated cooking pan equipped with motor-stirrer and stove. The construction of the equipment after assembling is shown in Figure 4 (right). This equipment is evaluated and carefully checked for their function prior to hand over to the SME. Training for using the equipment is conducted afterwards so the SME is able to determine the proper setting of the equipment which produces sambal as their expected standard quality.

To operate this equipment, the stove is turned on and the fire is adjusted necessary after pouring the vegetable oil to the pan as needed. The crushed chili and other complementary ingredients are sautéed in the hot oil. Stirring is carried out continuously until the sambal is cooked thoroughly. The stirrer is curve designed following the pan base so that all ingredients in the base of the pan can be agitated.

Table 1 shows the evaluation of this work in using the proposed cooking pan per batch of sambal production. Application of the integrated stirrer equipment requires electrical connection to run the tool and this comes with costs. Based on the results, it can be seen that production costs increased with the use of the cooking equipment and decreased the profit to 2.85%. There is an additional production cost for the cost of electricity in the stirrer application. Before using the equipment, the mixing process is conducted manually using manpower stirring throughout the cooking process. Hence there is no specific stirring cost for it. In this case, at least a worker is needed to keep stirring the mixture during the process to avoid over burned. By using this equipment, none of the workers has to stand by and handle the stirring process of the sambal. Hence, less worker is needed during the cooking process. This worker can be involved in other work part of SSO operational either in sambal production or in post-production process such as marketing. This means that less worker is required for the similar production capacity.

Table 1 also shows that the application of this equipment does not reduce the period for cooking per sambal batch. The desired level of cooking sambal is not affected by the stirring process. With or without this integrated stirrer, the cooking period is relatively the same which is about 1.5-2 hours. However, this continuous stirring tool help in setting homogeneity product, maintain consistency, avoiding uneven

cook and reducing the chance to over burned the sambal throughout the 1.5-2 h cooking process. This carefully cooking process supports to maintain the same level of the SME expected standard quality.

4. Conclusion

It can be concluded that the application of the integrated cooking pan equipped with motor-stirrer and stoves has actually resulted in a slight decrease (2.85%) of profits per batch sambal production. This application reduces the number of workers involved in the sambal production. Moreover, it helps SME in maintaining homogeneous and consistency of their product quality.

Table 1. Evaluation of application of proposed cooking pan in SSO per batch sambal production

No	Descriptions	Before Application	After Application
1	Chilly capacity per batch (kg)	6	6
2	Raw material cost (IDR)	340000	340000
3	Packaging cost (IDR)	300000	300000
4	Operational cost (IDR)	103200	105000
5	Cooking time (h)	1.5-2	1.5-2
6	Total of production time (h)	6-7	6-7
7	Total product (pot)	55-60	55-60
8	Price per pot (IDR)	25000	25000
9	Profit (IDR)	631800-756800	630000-755000

5. Acknowledgement

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References

[1] SNI, 2006 *Saus cabe*, Badan Standardisasi Nasional Jakarta No. 01-2976-2006

[2] SNI, 1998 *Sambel terasi*, Badan Standardisasi Nasional Jakarta No. 01-4865.1-1998

[3] Karim, M.S.A., Rashid, S.S.A., Adzahan, N.M. and Camillo, A.A., 2011. *J. Agribusiness Mark.*, Vol. 4 p. 68-92.

[4] Supit, J.W., Langi, T.M. and Ludong, M.M., 2015, *COCOS* Vol. 6, No. 7