



Application of Soft Bone Milkfish Processing Technology for Processed Fish SMEs in The City of Semarang

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Received: November 3, 2024

Revised: December 5, 2024

Accepted: December 19, 2024

Published: December 31, 2024

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DOI: [10.29303/ujcs.v5i4.771](https://doi.org/10.29303/ujcs.v5i4.771)

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Abstract: Processed fish in the form of soft bone milkfish is a superior product of the city of Semarang that needs attention because it involves many business actors and has an influence on regional economic growth. However, there are still many obstacles related to production and marketing aspects. This paper is limited to handling production aspects in two fish processing SMEs in Semarang City, namely CV New Citra and UD Putri Laut. The problem faced by the two SME partners is that the production equipment for pressure cooking milkfish has a small capacity so that productivity is less than optimal. Another problem is that the shelf life of existing products is not long enough. To overcome this problem, the implementation team carries out community service using several methods, including socialization, training and mentoring. After the two tools were successfully created, the implementation team provided training and assistance on how to operate the two tools until the partners mastered and were skilled. Currently these two tools have been used in the pressure cooker milkfish production process, and have been proven to be able to increase production capacity and quality. Based on field observations, pressure cookers are able to increase production capacity by up to 300 percent, saving fuel costs by 66.66 percent. The retort tool succeeded in increasing product shelf life by up to 1 year, and saved retort costs of IDR 600,000, per retort process.

Keywords: Pressure Cooker; Retort; Soft Bone Milkfish; Technology

Introduction

As stated in the IDRJMD (Regional Medium-Term Development Plan) of Semarang City for 2021-2026, the vision, mission, goals, and strategies of Semarang City for 2021-2026 are explained. As an implementation of the 2nd vision, namely increasing the potential of a competitive local economy, the targets include increasing superior regional products and increasing economic added value. The strategies to be implemented are through empowering the local economy (Jatmiko, 2020; Riansyah, 2023), increasing the productivity of SMEs (Utomo *et al*, 2023; Maskur *et al*, 2024), and increasing the marketing of regional products (Silaen *et al*, 2024). One of the superior products of the Semarang City region is processed fish, especially farmed fish in

the form of milkfish. Milkfish itself has a higher nutritional content, especially omega 3, than imported fish, namely salmon. In Indonesia and several other countries, milkfish (*Chanos chanos*) is known as a type of fish that has a distinctive taste (Soeyono, 2021; Isma *et al*, 2023; Setiawan & Wicaksono, 2024). The Fisheries Quality Research and Development Center (1996) has studied the omega-3 content of milkfish, which is 14.2% and this is higher than salmon at 2.6%, tuna at 0.2% and sardines/mackerel at 3.9%.

The Semarang City, which is located in a coastal area, has the potential for milkfish ponds. Data from 2020 showed that milkfish production was 1046.77 tons with a value of more than 23 billion (Bappeda Kota Semarang, 2021). This of course supports the development of superior products in the Semarang City

How to Cite:

Sunyoto, S., Saputro, D. D., Prasetyo, P. E., Ratnawati, J., & Rachmadi, M. F. (2024). Application of Soft Bone Milkfish Processing Technology for Processed Fish SMEs in The City of Semarang. *Unram Journal of Community Service*, 5(4), 544-549. <https://doi.org/10.29303/ujcs.v5i4.771>

area. As is known, one of the superior products of the Semarang City area, and a typical souvenir of Semarang City, is processed milkfish in the form of soft boned or presto milkfish (Kusumawati & Arizqi, 2021; Mubarok, 2023). To empower milkfish processing business actors, since 2009 the Bappeda of Semarang City has also formed a business group called the Milkfish Cluster whose members are producers or SMEs of processed milkfish (Semarang Mayor's Decree, 2014).

Currently, there are more than 60 processed fish SMEs that are members of the Semarang City Milkfish Cluster. Of the many members of the cluster, after the community service implementation team conducted a field study, there were two milkfish processed producers that were considered quite advanced and had the potential to be developed to be even more advanced, which were then made partners in this community service activity.

The 1st partner is CV New Citra, with an address at Rogojembangan Barat 1 No. 31, Tembalang, Semarang, has pioneered the business of making presto milkfish since 2012. Initially, it only produced around 20 kg of milkfish per day. Thanks to the persistence of the owner, the business has continued to experience rapid development, and since 2020 the business has had the legality/legal entity of a CV with the owner as director, namely Mrs. Sari Noviani. Based on Mrs. Sari Noviani's statement, the average production of processed milkfish is 150 kg per day, which is processed into presto milkfish as much as 100 kg/day, and milkfish brains and steamed milkfish around 50 kg/day. Thus the need for milkfish raw materials at 1st partner is around 4,500 kg/month.

The average price of fresh milkfish raw materials is IDR 30,000/kg, so the value of fresh milkfish raw materials processed by 1st partner is IDR 135,000,000 per month. 1st partner processes large milkfish, 1 kg contains 3 milkfish. If producing 150 kg of milkfish/day, it will produce 450 milkfish. The selling value of presto milkfish at the producer level is IDR 45,000/box (vacuum packaging, contains 2 milkfish), and IDR 32,000/head (retort packaging). If calculated the sales value or turnover of processed milkfish production at 1st partner is around IDR 13,000,000/day or around IDR 390,000,000,-/month. 1st partner processed milkfish marketing is quite extensive, covering Semarang City and its surroundings (around 60%) and outside Semarang City, namely in Yogyakarta, Magelang, and Bandung (around 40%). Product promotion and marketing are carried out conventionally and online by utilizing social media/the internet.

The permits held by CV New Citra as a producer of processed fish are quite complete, including having Halal, BPOM, and SKP (Processing Eligibility Certificate), SNI Certificate from BSN, and currently (2024) in the process of obtaining a HACCP Certificate.

2nd partner is UD Putri Laut, with an address at Purwosari Raya, Tambakrejo District, Semarang. The owner/manager of the business is Mr. Suhartono, who initially pioneered a fish processing business in the form of crispy fish since 2001. However, since 2016, he has focused on the production of presto milkfish until now. Based on Mr. Suhartono's statement, on average, he processes 100 kg of fresh milkfish per day to make presto milkfish, and only a small portion is made into milkfish brains. Thus, the need for milkfish raw materials at 2nd partner is around 3,000 kg/month. The average price of fresh milkfish raw materials is IDR 30,000/kg, so the value of fresh milkfish raw materials processed by 2nd partner is IDR 90,000,000 per month.

2nd partner processes medium-sized milkfish (1 kg contains 4 milkfish) and large-sized milkfish (1 kg contains 3 milkfish). The product is sold based on weight, at the producer level the price of presto milkfish is IDR 85,000/kg. From 100 kg of milkfish raw materials, after becoming presto milkfish it becomes 60 kg (60% of the raw materials). Thus the sales value/turnover of 2nd partner is around IDR 5,100,000/day or IDR 153,000,000/month. 2nd partner processed milkfish marketing is mostly (75%) still within the scope of Semarang City and its surroundings, and around 25% of marketing has reached outside the city, with a reseller system, including in Jakarta and Medan. Product promotion and marketing are carried out conventionally and online by utilizing social media/internet.



Figure 1. Conventional pressure cooker used by milkfish producers

The permits owned by UD Putri Laut as a producer of processed fish are also quite complete, including having Halal, SNI, and SKP (Processing Eligibility Certificate) certificates, and are currently in the process of obtaining BPOM permits. From the production aspect, the two SMES partners above have the same problem, namely that the pressure cooker currently has limited capacity, thus hampering business productivity. Conventional pressure cookers on the market are generally only able to cook a maximum of 25 kg in one process. For example, to cook 100 kg of milkfish, 4

pressure cookers and 4 LPG gas stoves will be needed. Of course, this takes up space and wastes fuel.

Another problem that needs to be addressed is how to make the marketed presto milkfish have a longer shelf life. So far, the most common way to increase the shelf life of milkfish is by using a vacuum packaging technique and storing it in a freezer. However, this method still has shortcomings, the storage capacity is still limited, a maximum of 3 months. In addition, business actors must also prepare a special cooling device (freezer).

To overcome the problem of presto milkfish production equipment and the preservation techniques mentioned above, it is necessary to apply a modern pressure cooker and a retort sterilization tool. The modern (non-conventional) pressure cooker in question is a pressure cooker developed by the community service implementation team, which has obtained a patent with the number IDP. 000058557, entitled Soft-Spine Milkfish Cooking Tool with Temperature and Time Control (Sunyoto, 2019).

To overcome the problem of the short shelf life of presto milkfish, it can be overcome with the retort technique. Retort is one of the thermal food preservation techniques, which has many advantages, namely a shelf life of more than six months (Estianah, 2009), even up to 1 - 2 years (Jason, 2021). In this retort process, food is heated at a temperature of 121-130° C for a certain time (about 20 minutes), using a special tube that is similar to a pressure cooker. In the retort process, if using steam injection directly guarantees the speed and uniformity of the incoming heat (Muchtadi, 2022).

Method

Based on the problems in the production aspect, the solution is to create and implement a modern pressure cooker and retort tool. The target of this activity is to produce 2 (two) units of modern pressure cooker and 2 (two) units of retort which will later be implemented in 2 (two) partners, namely CV New Citra and UD Putri Laut. In carrying out the activities, various complementary methods are taken so that the expected output targets can be achieved effectively and efficiently. Some of the methods that are to be implemented include.

Socialization

This method is used to deliver theoretical material. Among others, socialization of activities related to the objectives and benefits of the Regional Superior Product Business Partner Empowerment Program (PM-UPUD), and its relation to the development of regional superior products in the Semarang City. Other materials that will be delivered in this activity are the importance of

implementing appropriate technology, the advantages and benefits of that will be implemented. This activity also explains how to use, maintain and overcome obstacles in using the equipment provided.

Training

This activity is carried out mainly in the production aspect in using fish processing machines/tools. The implementation team demonstrates how to use appropriate technology machines/tools, namely modern pressure cookers, retorts and other supporting equipment used in producing presto milkfish. Partners and all workers involved are explained starting from preparation, steps of use, how to maintain and repair if damage occurs.

In this activity, business actors/workers are asked to try/practice directly in using machines/tools as demonstrated by the implementation team. In this way, it is expected that participants will quickly become skilled because they feel and experience for themselves how it works or how to operate the fish processing production machine/equipment.

Mentoring

The mentoring method is carried out in handling aspects of production and product marketing. After being given socialization, demonstrations, and having practiced, partners still need to be given mentoring and supervision before they are truly skilled/mastered. This is to avoid the possibility of mistakes because they are still in the learning stage. This method is also implemented to provide opportunities for partners/business actors to be independent or not dependent on the implementing team.

The PM-UPUD implementing team is selected from various disciplines to support the success of the activity. To achieve the target output of the program, this activity involves lecturers, partners and students from various fields of expertise. To find out the extent of the success of the PM-UPUD program, an evaluation is carried out. The evaluation is carried out in three stages, namely before, during, and after the activity. The evaluation before the activity is used as a comparison, which describes the initial condition of the partner at this time or before the activity.

Evaluation during the activity aims to determine the extent of the effectiveness of the various activity methods implemented. This evaluation is important to be carried out in order to find out the shortcomings or weaknesses of the activity in order to achieve the output target, so that it can be immediately addressed before the activity ends. Evaluation at the end of the activity (after) is carried out to find out to what extent the output target has been achieved. The success of this activity will later

be clearly seen by comparing the conditions before (before) and after (after) the PM-UPUD activity.

Result and Discussion

In order to overcome problems related to production aspects, appropriate technology (TTG) has been produced for the production of soft boned milkfish (pressed milkfish) in the form of 2 (two) modern pressure cookers and 2 (two) sterilization units (retorts) which are applied to 2 (two) partners (CV New Citra and UD Putri Laut).



Figure 2. Handover of pressure cooker to 1st partner (CV New Citra)



Figure 3. Handover of pressure cooker to 2nd partner (UD Putri Laut)

Pressure Cooker Technical Specifications:

- Height: 110 cm
- Diameter: 60 cm
- Pot Material: Stainless Steel (SS 304)

- Pot Thickness: 3 mm
- Capacity: 70 kg milkfish (200 fish)
- Fuel: LPG
- Cooking time: 2.5 - 3 hours
- LPG consumption: 2 kg

Some of the advantages of this pressure cooker include: 1) Higher productivity: in one process it can cook 50 - 70 kg of milkfish, 2) Cost-effective: in one process it only requires 2 kg of LPG fuel, 3) Time-saving: in one process it only takes a maximum of 3 hours, 4) Higher quality: 0% damage rate, no milkfish is damaged due to bending or flattening, because the diameter of the pressure cooker is 60 cm and in the arrangement of the milkfish, layers are made, and the protein content remains high because the temperature is set lower (below 120 ° C), 5) Safer and more practical: the pressure cooker is equipped with a temperature indicator, pressure, safety valve, temperature control and timer, making it safer and easier to operate.

This pressure cooker is equipped with temperature control which aims to regulate the high and low heating temperatures that correlate with fuel consumption. Temperature control (Temperature Controller) is connected to the gas flow control valve, functions to regulate the flame, where if the desired temperature is reached, the stove flame will automatically decrease (not go out). Conversely, if the temperature drops below the desired value, the stove flame will automatically increase and the temperature will rise again. With this system, it will make it easier for the operator/cook and fuel consumption will be more controlled/more efficient. In addition, this pressure cooker is also equipped with a timer, which functions to automatically regulate the cooking time. The stove will turn itself off based on the specified cooking time (around 3 hours), making it easier for the operator to operate this pressure cooker. In addition to modern pressure cookers, in this activity, partners have also produced sterilization tools (retorts) as shown in Figure 4. There are 2 (two) units given to two partners, namely CV New Citra and UD Putri Laut.



Figure 4. A set of retort equipment, consisting of steel tubes, product racks, and steam boilers

Technical Specifications of Retort Equipment:

- Tube Height: 110 cm
- Diameter: 60 cm
- Tube Material: Stainless Steel (SS 304)
- Tube Thickness: 3 mm
- Capacity: 200 milkfish in retort packaging
- Heat source: Steam from a steam boiler
- Heating temperature: 121° C
- Heating time: 20 minutes

Currently, both partners of presto milkfish producers have implemented fish processing technology, namely modern pressure cookers. Milkfish production has also increased, with a pressure cooker that takes a long time to cook, it can only cook a maximum of 25 kg or 75 milkfish. With the new pressure cooker, one cooking can cook 220 milkfish (around 70 kg) or almost 3 times (300%) from before. By using this pressure cooker, in addition to saving energy, it also saves production costs, namely the cost of LPG gas.

To cook 220 milkfish, with the old equipment, at least 3 LPG gas stoves are needed at a cost of around 6 kg of LPG gas x IDR 7,000, - or IDR 42,000, -. With the new pressure cooker, only one stove is needed with an LPG gas requirement of around 2 kg or IDR 14,000, - So by implementing this, it can save costs of around IDR 28,000, - or 66.66%. To increase the shelf life of presto milkfish, in this activity the two partners have also implemented a sterilization tool (retort). This tool is very helpful for presto milkfish producers because it saves the cost of retort services that were previously carried out. The retort service for presto milkfish that was previously issued was IDR 3,000 per head (1 aluminum foil package). If retorting 200 packages per day, then the cost incurred is 600 packages x IDR 3,000 = IDR 600,000. With this PM-UPUD program, partners can save costs of IDR 600,000/day.



Figure 5. The production process of presto milkfish at CV New Citra using a pressure cooker and retort tool after the PM-UPUD program (2024)



Figure 6. The production process of presto milkfish at CV New Citra using a conventional pressure cooker before the PM-UPUD program (2022)

From the production aspect, the explanation and picture above show a real difference before and after the community service program (PM-UPUD). Thus, the objectives of this program have been quite successful.

Handling the production aspect will increase productivity and product quality, which in turn will also have an impact on the marketing aspect of the product. With the implementation of this, both partners also showed an increase in marketing. Based on data collection and interviews with 1st partner, the marketing points/sales points for New Citra products are currently (2024) spread across four cities/regions, namely Semarang city 64 points, Salatiga city 15 points, Magelang city 26 points, and Yogyakarta city 82 points. So in 2024 there will be 187 marketing points or an increase of 18 points (10.65%) compared to the previous year (2023) which had 169 points.

At Partner 2 (UD Putri Laut), there has also been an increase in marketing, which is marked by the addition of agents/marketing points. Currently (2024) there are 12 outlets, consisting of 10 outlets in Semarang City. 1 agent in Kendal city and 1 agent in Jakarta city. In other words, there was an increase of 5 agents/outlets (41.66%) from the previous (2023) of 7 agents/marketing points.

Conclusion

Based on the activities that have been carried out, it can be concluded that this community service program has been successful, in accordance with the targets and outputs that have been previously determined. In terms of production, the activities have produced appropriate technology (TTG) for production in the form of 2 (two) modern pressure cookers and 2 (two) retort tools that have been applied to 2 (two) partners, namely CV New Citra and UD Putri Laut. With the application of this

modern pressure cooker, production capacity and product quality can be increased, and have an impact on increasing marketing. Based on field observations, the modern pressure cooker is able to increase production capacity by up to 300 percent, and can save LPG gas fuel costs by up to 66.66 percent. The retort tool has succeeded in increasing product shelf life by up to 1 year, and saving retort costs of IDR 600,000, per retort process.

Acknowledgments

Gratitude is expressed to several parties involved in the implementation of the community service program of the Community Empowerment of Superior Regional Products (PM-UPUD) scheme, especially to the Ministry of Education and Culture, Research and Technology (Kemendikbudristek) which has funded this activity. Gratitude is also expressed to the leadership of the Institute for Research and Community Service, Semarang State University LPPM UNNES), the leadership of CV New Citra and the leadership of UD Putri Laut, as well as all parties involved in this activity.

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