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Improving Hygiene and Sanitation Behavior among *Pemindang* Workers in Kusamba Village Through Direct Training and Demonstration Plot

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Abstract. Kusamba Village is one of the largest *pemindangan* centers on the island of Bali where located in Dawan District, Klungkung Regency. They carry out a very traditional scanning process with very simple facilities and infrastructure, such as storing fresh fishes left on the dirty floor, equipment for boiling from used drums. In the salting process, they use brown and dirty salt, and use water from well water that close to the sewer. The boiling process is carried out repeatedly for several times, until the fish as raw material runs out. Waste drainage is filled with garbage and smell bad. We carried out community service activities with the priority of improving hygiene and sanitation to improve the quality of *pindang*. We gave direct training and demonstration plot of *pindang* processing followed by an evaluation one month later. We expected that this community service will be implemented sustainably in Kusamba.

Keywords: *hygiene, sanitation, Pindang, Bali*

1. Introduction

Most of the world's protein sources come from fish and other types of seafood. Most of the world's population depends on 20% of their animal protein needs from fish [1]. Fish and seafood contain many nutrients in particular, including the long chain polyunsaturated fatty acids (PUFAs) eicosapentaenoic acid/docosahexaenoic acid (EPA/DHA), which are reduced heart diseases. Dietary Guidelines for Americans (DGA) recommends consuming 250 mg of EFA daily, which can be met by consuming at least 8 ounces of seafood per week, especially marine-derived "oily" fish such as salmon, mackerel, sardines, pompano, anchovies, swordfish, trout, and tuna [2].

Although fish has many health potentials, fish is a type of food that is easily decayed, so it requires proper handling and preservation methods to extend shelf life and maintain nutritional quality and content. [3]. The main purpose of fish processing is to prevent fish from experiencing decay or deterioration in quality. An example of real action in achieving this goal is to keep the fish alive until it's ready to be cooked. For thousands of years, China achieved this through the aquaculture of carp. Other methods used to preserve fish and fish products include: controlling temperature using ice, refrigeration, or freezing, controlling water activity by drying, salting, smoking, or freeze-drying, physically controlling of microbial loads through microwave heating or ionizing irradiation, chemically controlling microbial loads by adding acids, and oxygen

deprivation, such as vacuum packing [4]. One type of fish processing that is mostly done in Indonesia is pemindangan. Pemindangan is traditional fish processing that used the mixture of salting and boiling, not only to preserve the fishes, but also enhance the taste and add values [5].

Kusamba Village is one of the largest pemindangan centers on the island of Bali where located in Dawan District, Klungkung Regency. A fish shelter or hall of pemindangan was established on a land area of 2296, 50 m² and was able to accommodate approximately 77 shelterers. Fish needs in Kusamba Village per day reach 20 tons, fish do not only come from the catches of Kusamba fishermen, but also from Amed - Karangasem, Tanjung Benoa, Kedonganan, and Ambengan, some even come from the waters of Banyuwangi and Lombok. In 2007, based on the Decree of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number: KEP.01 / MEN / 2007 [6], concerning the Location of the Development of Fisheries Product Processing Centers, Pindang Processing Centers in Kusamba Village, Dawan District, Klungkung Regency was determined as the Center of Pemindangan in Bali. However, in practice, there are still many things that do not work as they should, starting from the fish processing process that has not been done well, the drainage is full of garbage and remnants of processing which cause the water flow to run smoothly, causing very bad odor, sanitation and hygiene that do not meet the requirements so that it has an impact on the product quality

There are as many as 50 units or groups of fishery products processing in the center of pemindangan at Kusamba Village, Klungkung Regency. Most of them conducts a very traditional process of pemindangan with very simple facilities and infrastructure, such as storing fresh fishes left on the dirty floor, equipment for boiling from used corroded drums. The salt used is brownish in a color and large in size, and the water used for boiling process comes from well water that close to the sewer. The boiling process is carried out repeatedly for several times, until the fish as raw material runs out. The wastewater from pemindangan process is flowing out to a channel that leads directly to the sea, so that it pollutes the environment, plus waste drainage that is filled with garbage and causes odor. These things can be suspected because the knowledge, attitudes, and behavior towards sanitation and hygiene of pemindangan process is still lacking. Pemindangan process in Kusamba are considered to be oriented towards fulfilling the supply of pindang, not on the quality and hygiene of the pindang. This low quality and hygiene is what has led to the emergence of many cases of pindang poisoning in the community. An extraordinary event of diarrhea in Karangasem in 2010 was called starting from product of pindang that spread E. Coli pathogens [7]. We held community service in Kusamba Village about standard fish processing with aims to improve the knowledge and skills of traditional workers there, so that they can produce high quality product and safe to be consumed.

This community service activity was held in Kusamba Village from July until August 2018. We used several kind of methods, such as: social approach in the form of observations and special dialogues to collect and identify problems faced by pindang workers, counseling and training so that our partners get knowledge about the cold chain system method in the supply of raw materials, standard pindang processing, as well as the handling of residual waste from pindang processing, direct practice or demonstration of the techniques given during counseling and training so that our partners can apply these techniques independently. The application of this method of activities such as training, and direct practice is expected to increase knowledge, ability, and skills and can add value to pindang as products of Kusamba in terms of quality improvement so that they can be registered under Indonesia Department of Health. Monitoring and evaluation are carried out

twice, right after giving material or demonstration and one month afterwards to ensure its implementation on daily practice.

2. Discussion

A. Hygiene and Sanitation in Central of Pemindangan, Kusamba

The biggest fish processing place in Bali is in Kusamba Village. At present the Kusamba Fish Center has 70 shelter blocks with each block consisting of one to two workers. This shelter center operates from 11 o'clock in the afternoon until 5 p.m. depending on the number of fish. Initially the fish processing center in Kusamba was only a business or home-based industry that was run in the middle of a residential environment, which then caused so many problems with local residents, especially related to environmental issues such as dirty and smelly fish markets. The also got the main ingredients only from local fisherman, so the *product* produced was very limited and low quality. Based on these problems in 1998 the local government built a special shelter or hall which is separated from the residents' housing and based on the regulations of the minister of fisheries and marine affairs number KEP.01/MEN/2007, the Kusamba fish processing site developed into a center of *pemindangan* in Bali. According to the production data taken in June 2018, the fish production reached 522.200 kg which included tuna, mackerel, *sardinella lemuru*, barramundi, and silk fish, with mackerel being the most fish variant catches which goes by 468.200 kg. Tuna, mackerel, sardinella, lemuru, barramundi, and silk fish are included to fishes that live a lot in Indonesia's water. They belong to *scombroid* type of fish [8]. Scromboid fish are the most commonly fish species that implicated in histamine toxicity or we called them "dark-meat fish", such as tuna, mackerel, skipjack, bonito, and marlin, while dolphin fish, amberjack, sardine, yellowtail, herring, and blue fish included to non scromboid fishes. Histidine. Many histidine compounds found in scromboid groups will be converted into histamine by bacteria producing histidine decarboxylase enzymes. Histamine poisoning in fish is usually triggered by poor storage conditions so that it is unable to control the growth of histamine-producing bacteria [9].

Before we start mentoring, we evaluate daily activities of *pemindangan* process there, including hygiene and sanitation based on points on Hazard Analysis Critical Care Point (HACCP). HACCP is a guideline containing a number of critical points related to food processing. Through the points sourced from HACCP, it is expected to emerge a risk management for problems that can or might arise in food processing. With the presence of HACCP, it is expected that there will be security guarantees for the consumption of food produced The actualization of HACCP has been carried out by various food industries, not only to prevent food security issues and to ensure that high-quality food products are produced and safe for consumption. [10-12].

The observations of hygiene and sanitation refer to the regulation of Sea Food HACCP (*Hazard Analysis Critical Control Point*), as follows [10]:

a. Water Safety

When referring to standards, the water used in food processing must be of standard drinking water, as well as that which applies to water for washing equipment. Most blocks use water pump machines and some use water from wells. Water is used as it is without adding chlorine or alum.

b. Tools

All equipment used in *pindang* processing is only washed once, when the *pemindangan* activities are finished that day. There is no pause for washing in the middle of scanning activities. All equipment is washed using soap and a sponge, soaking is sometimes needed. There are no separate chambers which can house the tools and the “*pemindangan*” process in Kusamba village.

c. Cross-Contamination Prevention

Cross-contamination is very likely to occur here, because *pemindang* workers do not wash hands, equipment and surfaces are often not cleaned when changing use. *Pindang* processing is carried out in the open, so it is possible for insects, rodents or animals to contact with the *pindang* produced, or with contaminated goods or equipment.

d. Hand washing facility, sanitation, and toilet.

There is only one toilet at the supervisor's office, but the condition when the observation carried out was damaged. Each block of *pemindangan* has one facility or sink as a place to wash equipment as well as a place to wash hands. Sanitation in each block is not well maintained, bamboo baskets are arranged carelessly, the floor is slippery and crusty, and the walls are mossy.

e. Ingredient-Contaminant Protection

With the condition of open buildings and the condition of roofs without ceilings, contamination is very possible, especially for insects and animals. Each block of *pemindangan* is connected with drainage for waste disposal. The large amount of garbage in the drainage cause drainage to become clogged and cause a strong odor.

f. Proper labeling, storage, and toxic substance utilization

There are not many toxic ingredients in Bali's scanning centers. The ingredients for washing dishes are placed in a sink with a label. Toxic materials such as EM4(effective microorganism) used in handling waste are placed in the supervisory room using large bottle without special labels.

h. Administering the health condition of personnel which can lead to contamination.

There are no regular health checks on workers. The average worker also does not have health insurance. Workers often complain of respiratory problems due to the use of firewood in *pindang* processing. There is no prohibition for sick workers to work. There is no direction to use masks, gloves, and headgear when working. Workers also do not use special clothes, and use the same clothes when working and returning home. Workers also complain of musculoskeletal disorders due to the high workload.

i. Pest extermination in the processing unit.

There is no specific cleaning schedule for each block of damage, only occasionally cleaning sewerage gutters if the water flow is stuck. There is no special thing that is done to pests or animals that contaminate the block of *pemindangan*.

B. Direct Training and Demonstration Plot for Pindang Workers in Kusamba

More than 50 percent of the workers work in the fish processing units of the Kusamba are female and under 50 years old. Most of them also do not have higher education or have ever attended food processing training. Almost all workers are native to the village of Kusamba. In the food processing industry including fish processing, female workers are more dominantly used. Such research has been carried out in Sri Lanka, where more female labor is needed in the fishing

industry sector. Female laborers are considered to be cleaner, more skilled, alert, and able to withstand long-term work shifts than male workers. But there are also reasons that state that female workers are more willing to be paid less than male labor. In the food processing industry including fish processing, female workers are more dominantly used. Such research has been carried out in Sri Lanka, where more female labor is needed in the fishing industry sector. Female laborers are considered to be cleaner, more skilled, alert, and able to withstand long-term work shifts than male workers. But there are also reasons that state that female workers are more willing to be paid less than male labor. The large number of female workers often makes it easier for providers of employment in this field to do recruitment or employment. This then made female workers willing to be paid below the standard, even the majority of female workers were not paid based on the number of working days, but were paid based on the amount of raw material they managed. [13].



Fig. 1. Demonstration Plot: All Participants Used Gloves and Mask



Fig. 2. Dialogue and Coordination

From 70 workers there, we only trained 2 workers that working in the same block of *pemandangan* to facilitate mentoring and evaluation, as in figure 1. Before starting the training session, we conducted interviews and dialogues regarding their habits and behaviors at work (figure 2). Through this process, it is known that they do not have an adequate knowledge base

regarding the work they have done so far, including the cold chain system, hygiene sanitation, and waste management.

We provided knowledge regarding the cold chain system for *pemindangan* process, considering that this topic is very important for workers in the fishing industry to be known. In the modern fish processing industry, the cold chain system is not new, but for fish processing in Kusamba, this system is quite difficult. The cold chain system is a management of raw materials designed to ensure the quality of materials in the whole process, from harvesting, processing, to distribution to the consumers, so that they remain in accordance with the expected quality or according to standards. Cold chain is called, because this system uses temperature control to maintain quality. In the fish processing industry, controlling low temperatures is believed to be able to maintain the quality of fish. Fish is one of the raw materials of food that is very sensitive to changes in temperature. Increased temperature is believed to increase the growth of decomposing bacteria [14-15].

Beside cold chain system, we also gave knowledge about hygiene and sanitation practice. We submitted the result of our observation regarding hygiene and sanitation based on HACCP. The changes that we expected more are related to personal hygiene and personal care as food handlers. As we know, hygiene is a preventive health effort that focuses on the activities of individual health and human health efforts. Whereas, sanitation means preventive health efforts that focus on efforts to health of the human environment. For food processors, hygiene and sanitation are very important factors to be considered, because they are related to the presence of microorganisms that can contaminate the products produced. The microorganism contamination can not only come from the product itself but also the results of cross contamination that comes from food processors or the environment around the food is processed. People or food processors are potential source of microorganism that cause illness in others through the transmission of viruses or through food poisoning, so that's why personal hygiene is really an important matter [16]. Some things that must be considered related to personal hygiene include always wash and dry hands thoroughly before handling food, wash and dry them again frequently during work, don't forget use soap and clean water for that. Never smoke, chew gum, spit, or eat in a food handling or food storage area, never cough or sneeze over food, or where food is being prepared or stored, use mask will be more safe. Always wear clean protective clothing, such as apron, keep spare clothes and other personal item away from where food is stored, it will be better to use gloves. Use cap or tie back or cover long hair, keep fingernails short and clean, avoid wearing jewelry. Cover all cuts or wounds with wound strip or bandage. Change gloves, mask, and cap regularly, tell supervisor if feel unwell. The last point is important because ill employees should not come in contact with food or equipment and utensils used in the processing, preparation, and serving of food to prevent cross contamination. Some human illness could be transmitted through food, such as common cold, sore throat, pneumonia, scarlet fever, tuberculosis, and trench mouth. Some intestinal disorders also very dangerous to be transmitted through food, likes dysentery; typhoid fever; and infectious hepatitis. Routine medical check-up to workers will be very important to prevent that diseases [16].

C. Evaluation and Monitoring

Because our participants can't read and write fluently, we were unable to conduct paper based evaluations. We made careful observations during the demonstration, whether the

participants followed it well or not. Before starting *pemindangan* procedure, such as washing hands before carrying out activities, all equipment before the activity has been washed, using a mask and gloves. We also help with several new equipment such as buckets and stainless steel boiling pans to replace old equipment. *Pemindangan* procedures include cleaning fish, all cleaned fish then arranged in bamboo baskets and salted, after that we continued by boiling the fishes in 100°C hot water for 30 minutes. The remaining boiling water is filtered before being thrown to the ditch.

One month after our activities, we conducted a re-evaluation and we found that our participants still did not behave hygienically (figure 3) and did not pay attention to sanitation in the processing of *pindang*. They still do not wash their hands before carrying out activities, do not use masks and gloves, still use pots from used drums, still use low quality salt. The limited funding of *pemindang* groups in providing hygienic infrastructure and improving sanitation is the reason for the low hygiene and sanitation in Kusamba's central of *pemindangan*. Our community service activities have succeeded in increasing the knowledge of *pindang* workers in Kusamba Village, but we have not succeeded in changing their behavior. Increased knowledge without being followed by an awareness to do, then the knowledge will not last long and will not be useful in real life.



Fig. 3. Evaluation: Participant still didn't Behave Hygienically

3. Conclusion

Through this community service activity, it is known that fish processing in Kusamba Village is still very traditional so it does not pay attention to hygiene and sanitation in producing *pindang* which is a daily food for Balinese people. Community service activities are very much needed in order to increase knowledge and change the behavior of the *pemindang* workers, so that the *pindang* produced there can be better in quality.

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