Village Development Program for Producing Iodized Salt for Sustainable Development Community

D Mardhia1*, D Syafikri1, F Yahya2, N Andriyani2, G Gunawan3

1Faculty of Animal Sains and Fisheries, Universitas Samawa, Indonesia
2Faculty of Teacher Training and Education, Universitas Samawa, Indonesia
3Faculty of Teacher Training and Education, Universitas Mataram, Indonesia

*Email: dwimardhia@gmail.com

Abstract. Setia Kawan Group is the partner of Samawa University in the Partner Village Development Program (PPDM) in producing iodized salt. The assistance provided to the Setia Kawan Group aims to overcome the problems faced by the group, especially the low salt production quality and quantity as well as the low salt prices which affect their business's development negatively. The methods of carrying out PPDM activities include counseling, training, equipment procuring, and assisting. With assistance through PPDM, the quantity of salt production has increased to 40 tons. In terms of quality, the salt meets the requirements of iodized salt raw material. So far, Setia Kawan Group sells salt only in the form of Krosok salt at a price of Rp 2,000 per kg. The production of iodized salt will definitely increase the income of Setia Kawan Group. Iodized salt is sold at Rp. 3,000 per 400 grams. If it is calculated, the income of the Setia Kawan Group increased by Rp.5,500/Kg.

1. Introduction

Labuhan Bajo Village, Utan Subdistrict is one of the villages designated as a salt-producing center in the Sumbawa Regency. This is because the village of Labuhan Bajo is supported by conditions of natural resources and adequate human resources. Labuhan Bajo village has an area of dry land that cannot be utilized for agricultural activities, which is 1,967 Ha or 90% of the area. This potential is best utilized as a salt pond business which is expected to become one of the important sectors in supporting the regional economy.

The Setia Kawan group is one of four groups of salt farmers in Labuhan Bajo Village. Through the partner village development program (PPDM), a team of Samawa University lecturers conducted mentoring activities to the Setia Kawan group. Assistance is carried out to help solve problems faced by the group. Some problems faced by the Setia Kawan group so that the group business has not yet developed and cannot provide promising results, namely the level of salting land productivity in Labuhan Bajo Village still needs to be improved both in quality and quantity because the current production conditions which are the quality of salt is still classified as KW 2 salt which means it has a low selling value of Rp. 800. Distributing and marketing are also an obstacle because all this time the group sells its own salt, so it needs a container like a cooperative to market their products. Another issue that is no less important is the lack of group knowledge related to appropriate salt production technology and the lack of knowledge about iodized salt production, although iodized salt production is a big opportunity to increase group income.
The production of iodized salt is a potential effort by the Setia Kawan group. This is because, in Labuhan Bajo village, there is no group of salt farmers that produce iodized salt [1]. So far, the need for iodized salt is imported from the islands of Lombok or Madura. The lack of iodized salt has an impact on the poor quality of public health. Iodine Deficiency Disorders (IDD) is one of several serious problems faced by IDD in Labuhan Bajo Village is quite high reaching 22.1%. Efforts to overcome IDD have been carried out nationally through short-term and long-term efforts, but in practice, there are still obstacles encountered namely the lack of iodized salt consumption by the community [2]. The addition of iodine to consumption salt is an appropriate and effective way to get maximum results in achieving iodized salt consumption in the community [3].

The purpose of empowering the Setia Kawan Group is to assist the group in increasing the quantity and quality of salt into KW 1 salt and producing iodized salt production that meets SNI requirements with iodine levels of 30-80 ppm in order to meet the needs of the community. Improvement of salt quality through the use of geomembrane. The commonly used geomembrane liner is high density polyethylene (HDPE) [4]. Iodized salt production is expected to increase their income but simultaneously meet the needs of iodized salt so that the problems associated with IDD [5].

2. Method

2.1. Time, Location and Activity Partners

The Partner Village Development Program (PPDM) was carried out in Labuhan Bajo village, Utan District, Sumbawa Regency, NTB Province (Figure 1). The location of partners with PPDM team colleges is ± 87.7 Km. The partners in this activity are the Setia Kawan group of 10 people. This group was chosen as a partner because it is not included in the KUGAR (People's Salt Business Group) so it needs to get the help of Science and Technology to improve the quantity and quality of the salt they produce. This group does not yet have the knowledge and skills in producing iodized salt.

2.2. Method of Activity Implementation

To overcome the problems of partners in the implementation of PPDM, there are several approaches taken, namely: (1) Participatory Technology Development: a model approach that utilizes science-based appropriate technology; (2) Community development: an approach model that involves partners directly as both the subject and object of the implementation of community service activities [6]; (3)
Educative: an approach through socialization, training, and assistance as a means of transfer of knowledge and education for partner empowerment. The stages of the implementation of this activity are:

a. Socialization and Coordination.
   Through this activity, the PPDM team provides information and direction to the Setia Kawan group about the implementation of activities and outcomes to be achieved from PPDM activities. At this stage also strengthened group commitment to the success of PPDM activities.

b. Preparation of activities.
   The activities carried out include the identification and preparation of PPDM activities starting from the preparation, implementation to monitoring and evaluation stages.

c. Training on making iodized salt.
   Through this activity, the group is taught how to make iodized salt with an iodized salt business trainer.

d. Production equipment assistance
   The production equipment assistance provided by the PPDM team was to assist the group in starting the production of iodized salt.

e. Assistance
   This stage was carried out to maintain the sustainability of the results of PPDM activities. After counseling and training activities, partners are assisted to be independent in producing quality salt and iodized. Partners also teach how to manage a business, product packaging is good and how to do product marketing in a more effective and efficient way.

f. Monitoring and evaluating activities.
   The evaluation phase aims to measure the success of PPDM activities carried out in Labuhan Bajo village. Evaluation is carried out at each stage of the implementation of activities and a comprehensive evaluation of the implementation of activities is carried out at the end of each year of the activity.

3. Result

3.1. Socialization and Coordination
   Socialization and coordination were carried out to the Setia Kawan Group. Coordination and outreach to the Setia Kawan Group resulted in the following agreements: (1) committing to activities to the end (2) increasing the production of quality and iodized salt (3) marketing salt (4) participating in socializing to the public the importance of consuming iodized salt.

3.2. Preparation of activities
   The PPDM team conducts a coordination meeting on the distribution of tasks for each activity implementation and prepares the things needed to support the smooth running of the activity including the preparation of tools and materials.

3.3. Salt Production Training with TUF and Iodization Methods
   This training aims to teach the Setia Kawan group how to improve the quality and quantity of salt and how to produce iodized salt. The method used to improve the quality and quantity of salt is the TUF (Filtering-threaded technology) system with insulator media. TUF is the modified technology of salt production integrating geomembrane technology through the serial plots [7]. According to [8] the principles of the TUF system are:

   a. The existence of threaded plots which are placed between reservoir plots and plots/nets which serve to filter impurities and precipitate chemical elements present in seawater such as calcium (Ca), magnesium (Mg) and sulfate (SO4), and increase water content from 3 Be to 8 to 10 Be through the evaporation process. The purpose of using filters is to filter the water entering and leaving each plot to be clean so that the salt produced is pure white;
b. Installation of insulating media on the salt table with the aim of coating the surface of the salt table so that the crystallization process does not come in direct contact with the soil, thereby speeding up the process of crystallization, speeding up the process of making salt and shortening and simplifying the work of harvesting salt. The advantage of using an insulator is that there is no improvement on the surface of the salt table after harvest so that subsequent salt production can be done directly without leveling the salt table surface. This condition causes TUF salt yields with more isolator media than the traditional method.

The salt-making process of the TUF method is as follows:

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| Step                      |
|---------------------------|
| Seawater                  |
| Banker I 5 day (7° Be)    |
| Banker II 5-7 day (15° Be)|
| Banker II 15 day (20° Be) |
| Crystallize seawater 5 - 7 day |
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**Figure. 2. Salt Making Process TUF Method**

Iodized salt training activities are carried out by trainers who are iodized salt businesses. The aim is to bring the trainer so that the group is taught directly by people who have long been struggling in the iodized salt business. The salt iodization method taught is to use the wet-dry method (mixing solid-liquid). In this process, salt is mixed with a liquid containing iodine by dropping or spraying. This method further guarantees the homogenization of yields, but the water content in salt will increase [5]. In group training activities are taught how to determine the right composition for KIO3 and salt and how to dilute KIO3 the process of which is 5 g of salt weighed and dissolved with distilled water, then added with KI solution (10%), packaging method, economic analysis of iodized salt business, the introduction of production equipment, business license management and how to market iodized salt. The results of the training activities are that participants understand and can practice the TUF and iodization methods.

**Figure. 3 Training Activities for Making Iodized Salt**
3.4. Aid for Production and Salt Production Tools Using the TUF Method with Iodization

Production equipment assistance given to the Setia Kawan group in the form of tools and materials needed for iodized salt production is as follows:

| No | Tools name | Number |
|----|------------|--------|
| 1  | Geoisolator | 6 roll |
| 2  | KIO₃       | 2 kg   |
| 3  | Salt Mixer | 1 unit |
| 4  | Digital Scales | 1 unit |
| 5  | Measuring cup | 2 unit |
| 6  | Big tub    | 5 unit |
| 7  | Sprayer    | 2 unit |

The TUF and Iodization method applied to the salt production of the Setia Kawan Group results in an increase in the quality and quantity of salt production. The yield of salt before the application of the TUF method was 863 sacks with a weight of 50 kg per sack, after the application of the TUF method with an insulator there was an increase in production to 880 sacks until the harvest on October 5, 2019 (not yet the final product of 2019). The quality of salt also shows a better physical condition, as evidenced by the increasingly clean white color. The production of iodized salt produced by the group possesses iodine levels in accordance with the requirements which is in the range of 30-80 ppm. This is in accordance with SNI requirements that salt reaching consumers must have an iodine level of 30-80 ppm [9].

3.5. Setia Kawan Group Income

Setia Kawan group income is seen based on the results of salt sales before and after producing iodized salt. Determination of income is based on the team's estimation by considering the amount of production and selling price of salt before and after using the TUF iodization method. 2019 production results are calculated until the harvest on October 5, 2019 (harvest is still done before the rainy season/January).

| Method/salt quality | Production result | The sale | Gross income |
|---------------------|-------------------|----------|--------------|
| Traditional/KW 2    | 863 sack (43.15 ton) | Per sack Rp 50.000 | Rp 43.150.000 |
| TUF dan Iodisasi/KW 1 | 880 sack (44 ton) | Per sack Rp 80.000 (in krosok it sold 680 sack or 34 tons) | Rp 54.400.000 |
| Difference           |                   | Iodized salt 250 grams of packaging for Rp 1.500/package of 50 sacks or 10 tons | Rp 15.000.000 |
|                      |                   |                      | Rp 26.250.000 |

3.6. Monitoring and Evaluation

Evaluation of the implementation of PPDM is carried out on the following matters:

a. Assessment of the level of partner participation: carried out by (1) monitoring and evaluating the number of attendance and enthusiasm of partners in every implementation of counseling and
training activities (2) assessing and evaluating success in each activity output. The evaluation results showed that 100% of the partners were present as requested by the number of participants and they followed the activity until the end. The Setia Kawan group shows their strong commitment in accordance with the agreement with the PPDM team, their salt production has increased by 17 sacks with salt quality also increasing to reach the KW 1 salt quality, iodized salt production continues and iodized salt quality meets the requirements of 30-80 ppm. The production of iodized salt will continue to be monitored during the following year.

b. Assessment of partner's level of knowledge and skills. After training activities in making iodized salt PPDM partners are already skilled in calculating the composition of salt and KIO3 solution, skilled in operating salt mixer machines, skilled in packaging iodized salt and skilled in using online media in publicly introducing iodized salt to their products which are branded with salt "MJ". The name MJ salt was taken from the names of the initiators of the Setia Kawan group, Mr. Marzuki, and Mr. Jumari. When viewed the percentage of skills can reach 70% meaning 7 out of 10 group members are already in the skilled category.

c. Evaluation of the overall success of the program: carried out by looking at several indicators of success, namely (1) An increase in the amount of salt production reached 317 sacks (2) There is an increase in the quality of salt into salt KW 1 (3) The presence of iodized salt (4) There is an increase in the number of people who consume iodized salt based on the results of interviews with counseling participants who previously did not consume iodized salt then consume iodized salt with a percentage of 22% or 4 of 18 respondents (5) There is an increase in the Setia Kawan Group income from the sale of krosok salt which was initially valued at Rp 50,000 per sack to Rp. IDR 80,000 per sack plus iodized salt sales which is sold at IDR 1,500 / 250 g packaging.

d. Potential sustainability of the program is the presence of news through mass media and videos uploaded through Youtube to expand information related to iodized salt production by partners and be able to encourage the wider community to consume iodized salt. Besides that, iodized salt production becomes a business that can increase business income so that the salt group can increase its income. With an increase in income can automatically increase the welfare and social status of partners.

4. Conclusion

Community service activities have been able to increase the production of salt in the Setia Kawan group. In terms of quantity, there was an increase in production to 17 sacks, while in terms of quality an increase in the quality of salt from KW 2 to KW 1. The group was also able to produce iodized salt, skilled in every stage of making iodized salt. With the production of iodized salt, there is an increase in the income of Rp. 26,250,000 or 23% until the harvest time on October 5, 2019. This amount will continue to increase until the end of the harvest in 2019.

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