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# Farmer's Behavior in Managing Postharvest in South Sulawesi, Indonesia

Fatmawati<sup>1,\*</sup> Lahming<sup>2</sup> Ahmad Rifqi Asrib<sup>2</sup> Nurlita Pertiwi<sup>2</sup>

<sup>1</sup>Agricultural Faculty, Universitas Bosowa, Makassar, Indonesia

<sup>2</sup>Postgraduate Program, Universitas Negeri Makassar, Makassar, Indonesia

\*Corresponding author. Email: [fatmawati@universitasbosowa.ac.id](mailto:fatmawati@universitasbosowa.ac.id)

## ABSTRACT

Seaweed production in South Sulawesi increased significantly and contributed to Indonesia total production in Indonesia. However, increasing production did not affect the welfare of coastal communities. This fact was significantly related to the behavior of farmers in post-harvest management. This study describes the determinant factors of the seaweed farmer's behavior in post-harvest management. The study focused in six parts, namely harvesting, drying, cleaning, packaging, transportation, and storage. The method of research was quantitatively surveyed and involved 200 seaweed farmers as samples. Data analysis uses descriptive quantitative and structural equation modeling (SEM). The results showed that the farmers' behavior in post-harvest management is not suitable for the three aspects of sustainable development. The three aspects are harvesting, drying and cleaning. While the packaging, transportation and storage were ideal for the sustainable development concept. As a result, product quality is not following industry standards. The factors that influence these behaviors are environmental knowledge, environmental attitudes, post-harvesting knowledge, and local wisdom. The attitude of farmers is the dominant effect on the behavior of post-harvesting management.

**Keywords:** Knowledge, attitude, local wisdom, seaweed

## 1. INTRODUCTION

Indonesia's marine export to commodities and a source of foreign income exchange and a source of income for coastal communities. Introducing the seaweed cultivation technology is very simple and inexpensive. The community empowerment in the processing of seaweeds provides excellent opportunities for coastal communities. However, various previous studies describe that the seaweed industry's raw materials face constraints of limited quality production. Furthermore, quality is caused by cultivation techniques and post-harvest technology. However, seaweed has contributed to the welfare of the people in Indonesia.

During the period 2009-2018, three seaweed production centers had the highest production volume in South Sulawesi, namely Takalar Regency, East Luwu Regency, and Bone Regency. Takalar Regency is an area that is dominated by the characteristics of the coastal region that is 86.10% or 48.777 Km<sup>2</sup>. In this region, the volume of seaweed production has increased but the selling value of seaweed production is relatively low. As

a result, increased production does not contribute to the welfare of farmers [1].

Post-harvest handling is one of the factors that determine the quality of seaweed. The quality of seaweed that meets the country's export and manufacturer requirements is for the type of *Eucheuma* sp, water content 31-35%, dirt and salt not more than 5%, and marinade not less than 25%. As for the types of *Gracilaria* sp. The moisture content of 18-22%, dirt and salt was not more than 2%, and the immersion was 18-20%. Field facts show that these quality standards do not meet requirements. Due to the high water content, there is damage to seaweed during storage. The behavior of farmers in seaweed management starts from the cultivation, harvesting and post-harvest handling stages. Furthermore, seaweed post-harvest handling technology plays an essential role in maintaining quality and preventing damage to the drying and transportation process [2].

Washing seaweed that does not meet the requirements can cause high salt levels and impact the low selling price of seaweed. On the other hand, most farmers consider the

facts at the research location that the higher the seaweed salt content, the better [3]. Field drying activities generally do not pay attention to the quality of seaweed in accordance with industry standards. Farmers sell with high water content so that the selling value is low. Furthermore, in the drying stage, farmers spread fresh seaweed with a plastic net on the sand, so there is direct contact between seaweed and beach sand. When it rains, seaweed is collected and covered with tarpaulin [4].

This phenomenon is closely related to the behavior of farmers in post-harvest management. Hungerford and Volk suggested that the factors that influence environmental behavior are knowledge of the issue, skills in action, desire to act. In this case, situational factors are economic, social, personality or attitude factors, locus of control, and personal responsibility [5]. The cognitive aspects of farmers come from conscious thoughts and past experiences.

Therefore, this study aims to examine the behavior of marine family farmers in post-harvest management. The results of this study form the basis for developing farmers' capacity to improve production quality.

**2. RESEARCH METHOD**

This study describes the behavior of seaweed farmers in post-harvest management and its determinant factors. Post-harvest management includes six parts, namely harvesting, drying, cleaning, packaging, transportation, and storage. The method of research was quantitatively surveyed and involved 200 seaweed farmers as samples. Data analysis uses descriptive quantitative with ratio method, while the influence analysis uses Structural Equation Modeling (SEM). Ratio analysis as a basis for determining the suitability of behavior with the concept of sustainable development (table 1).

**Table 1.** Suitability Category

Ratio	Suitability with Sustainable Development
0.10 – 0.25	Very low
0.26 – 0.50	Low
0.51 – 0.75	High
0.76 – 1.00	Very high

**3. RESULT AND DISCUSSION**

**3.1. Farmer Behavior in Post-Harvesting Management**

Post-harvest management consisting of six components shows that farmers have shown good packaging, transportation, and storage, which offers a ratio of 0.65 - 0.85. In contrast, the aspects that did not meet the requirements were harvesting, drying, and washing of seaweed, which showed a ratio of 0.45 - 0.48.

the ratio between post-harvest management aspects can be seen in the following table.

The behavior of seaweed farmers in Takalar Regency is pro-environment, namely harvesting in the morning with sunny weather, so there is no damage to seaweed before drying. Washing seaweed after harvesting in the sea with a rope by rocking in seawater, then transported ashore to be separated from the rope. Washing seaweed does not use freshwater or wells that are around the settlement. The reason for farmers to wash their crops is to remove dirt and maintain environmental sanitation or prevent the risk of environmental pollution to the settlements of seaweed farmers [6]. Seaweed that has been transported ashore or by the seafront is immediately freed from the straps by hooking it to two blocks or boards.

**Table 2.** Ratio of Aspects Post-Harvest Management

Post-harvest management	Ratio	Information
Harvesting	0.46	Not suitable
Drying	0.48	Not suitable
Washing	0.45	Not suitable
Packaging	0.68	Suitable
Transportation	0.82	Suitable
Storage	0.85	Suitable

Drying is done by spreading seaweed in bamboo racks (para-para) to utilize the sun's heat. Before spread it, the farmer cleaned and released from the ropes on the coastline with nylon nets. The characteristic smell of seaweed does not cause environmental pollution in seaweed farmer settlements in particular and the community at large. Physically the characteristics of dried seaweed are seen visually by farmers. The cleanliness and color, dirt, or foreign objects are soil types carried during the drying process, including sand, rocks, ropes used for seaweed ties, and bright colors (2). The texture of dried seaweed is related to the plasticity and hardness of the clay, which is not easily broken between the thaluses. If held, it will feel stiff and somewhat painful in the hands, moisture content ± 35% of the drying results. (3) The specific odor of seaweed is the natural smell of seaweed [7].

Farmers carry out seaweed packaging after drying for two to three days, depending on the sun's heat intensity. Seaweed that will be shipped requires proper containers or packaging. Farmers do the packaging of dried seaweed thoroughly or manually. They used net or plastic sacks, such as rice bags. The use of packaging repeatedly an action that can reduce the supply of plastic waste that can impact pollution to the environment.

Freight or transportation is a series of post-harvest seaweed handling activities at the farm level. The type of transport used at the farm level uses carts and motorbikes.

However, farmers always sell to traders in the drying place or in temporary storage in the neighborhood or under the house. Important things to consider in transportation must not be exposed to freshwater, such as rainwater, well water [8].

Storage is the most recent action taken by farmers and collectors who are also seaweed farmers. The process of packing and transportation to the storage equipped many instrumentation like haulage carts, sack pulling equipment, sitting scales, weighing scales, press and packing aids, stationery, and labels. Furthermore, further processing will be carried out in the seaweed processing development industry.

Actions to achieve the quality of dried seaweed, seaweed farmers pay less attention to the quality of seaweed, which is contained in the Indonesian National Standard (SNI) No. 2690.1.2009. and 2690.2015. about dried seaweed.

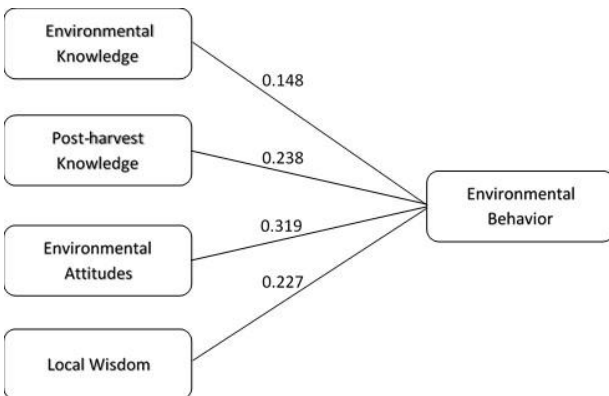
**3.2. The determinant factor of farmer behavior in post-harvesting management**

SEM analysis results show the four elements' influence on farmers' behavior in post-harvest direction (table 3).

**Table 3.** Farmers behavior in post-harvest management factors

Factors	Probability	Information
Environmental Knowledge	0.000	Affected
Post-harvest Knowledge	0.000	Affected
Environmental Attitudes	0.001	Affected
Local Wisdom	0.000	Affected

Probability values smaller than 0.005 indicate that all factors influence farmers' behavior. The next analysis is how strong the linkages are among the determinant factors (figure 1).



**Figure 1** Relation of factors to the farmer behavior

The results of the correlation analysis between the four factors on post-harvest behavior refer to table 4.

**Table 4.** Correlation Analysis of Post-Harvest Behavior

Correlation	Information
0.00 – 0.25	Very Weak
0.26 – 0.50	Weak
0.51 – 0.75	Strong
0.76 – 1.00	Very Strong

Factors of environmental knowledge, post-harvest knowledge, and local wisdom have a shallow influence on farmers' behavior. At the same time, environmental attitude shows low influence. The value of the closeness of the relationship between environmental attitudes with behavior is stronger compared to other factors. The results are consistent with Courtenay-Hall and Rogers's expressions that environmental knowledge shapes environmental attitudes and ultimately shapes environmental behavior [9]. Another study explained that farmers need sufficient knowledge and experience in forming good behavior to form a good attitude.

**4. CONCLUSION**

The results showed that the behavior of farmers in post-harvest management is not suitable for the three aspects of sustainable development. The three aspects are harvesting, drying, and cleaning. While the packaging, transportation and storage were suitable for sustainable development concepts. The result of probability analysis shows the value that indicates that all factors influence farmers' behavior. Furthermore, the attitudinal factor shows the highest correlation with the behavior of farmers in post-harvest management.

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