

## 学 位 論 文 の 要 旨

論文題目            Developing Risk Management Framework for Small-scale Shrimp Farming  
                                 - A Case Study in East Java, Indonesia -

(小規模エビ養殖業のためのリスク・マネージメントの発展—インドネシア、東ジャワの事例—)

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Aquaculture becomes the main contributor to Indonesian fisheries products to fulfill the fast growing of domestic and global demand. Ministry of Marine Affairs and Fisheries of Republic of Indonesia stated that total production of aquaculture reached 14.35 million tons compared to 6.48 million tons made up from capture fisheries production. Thus, the FAO ranks Indonesia as the second largest aquaculture producer in the world. Indonesian export commodities were dominated by seaweed, shrimp, tuna, crab, and pearl. Among those commodities, shrimp was the largest (49.42%) in term of value in a couple of years.

Indonesia exports two primary species of shrimp, consist of the giant black tiger (*Panaeus monodon*) and pacific white leg shrimp (*Panaeus vannamei*). Compare to the giant black tiger, *vannamei* contributes two third (1.5 million tons) of the total Indonesian shrimp production. In a couple of years, the production of *vannamei* increased consistently by an average of 13.82% per year. Such a fast growth of Indonesian shrimp production has caused many challenges. Shrimp diseases, environmental degradation, shrimp price fluctuation, and product rejection from importing countries were some of the few issues that affected Indonesian shrimp production in the last several years. Therefore, shrimp farming today is being increasingly exposed to risk and uncertainty in which those risks inherent to all activities in their business. All those risks are potential to damaging shrimp industry and need to be managed in a systematic way for sustainability of shrimp industry. Thus, a solid risk management framework is much needed for Indonesian shrimp industry, particularly in small-scale level.

The purpose of this study is to develop a risk management framework for Indonesian

small-scale shrimp farming. Two specific objectives are proposed, consist of (1) to investigate the small-scale farmers' attitude and perception of risks and risk management strategies related to small-scale shrimp farming; (2) to develop a risk management framework through identifying the sources of risk and management strategies, as well as evaluate the effectiveness of existing management strategies. This study was carried out in two areas of East Java, Indonesia. They are Lamongan (South coast of East Java) and Banyuwangi (North coast of East Java) district, which were selected purposively due to the main shrimp producing areas in East Java. Purposive random sampling using the Taro Yamane formula was conducted to select the sample of small-scale shrimp farmers in the study areas. A total of 166 small-scale shrimp farmers were selected. Before starting field surveys, in-depth interviews with the extension officers, academia, and head of shrimp farmer groups was conducted to avoid missing any relevant information.

This study used Exploratory Factor Analysis (EFA) and multiple linear regression to measure the impact of socioeconomic characteristics of farmers on their perception of risk and management strategies. Based on factor analysis, the results revealed that *input and pond preparation, finance and credit access, production, personal, harvesting and marketing, weather and environment, policy and institutional, and business environment* were major sources of risks in shrimp farming. The findings of regression indicate that the farmers' perceptions were influenced by various factors such as the age, experience, education level, availability of off-farm income, and location of a shrimp farm. Our results indicated that the farmers' perception of risk and risk management strategies are farm specific. The findings showed that the shrimp farmers develop a range of strategies and conversely, a risk management strategy can apply to mitigate different types of risk source.

Regarding developing the risk management framework for shrimp farming, this study used the AS/NZS ISO 31000:2009 standard as the foundation of the framework due to its appropriateness to the scale of Indonesian shrimp industry, which mainly at the small-scale level. The AS/NZS ISO 31000:2009 standard consist of seven-step risk management process, which are (1) Communication and consultation, (2) Establishing the context, (3) Risk identification, (4) Risk analysis, (5) Risk evaluation, (6) Risk treatment, and (7) Monitoring and review. Moreover, Business Process Model (BPM) method has been explicitly used in the third step to identify the sources of risk involved in small-scale shrimp farming. Based on the results, this study found that the farmers had six risk management options to deal with the

risks in their shrimp farms. The framework allows the farmers to choose the optimal risk management strategies based on the degree of efficacy of management strategies. Specifically, the framework allows the shrimp farmers to measure, rank, analyses, and priorities the risk for treatment in their business.